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ABSTRACT

This curriculum guide for students in grades K-4 is part of the My Health My World Series. It explores environmental issues, focusing on food and the environment. The unit includes (1) an activities guide for teachers entitled, "Food and My World," which presents activity-based lessons that entice students to discover concepts in science, mathematics, and health through hands-on activities (nutrition, physical science, biology, and environmental health); (2) a colorful illustrated storybook entitled, "The Mysterious Marching Vegetables," which teaches science and health concepts throughout the story; (3) a reading activities booklet entitled, "The Reading Link," which presents reading activities that are designed for use with "The Mysterious Marching Vegetables"; and (4) "Explorations for Children and Adults," a mini-magazine full of information, activities, and fun things to do in class or at home related to the food people eat, healthy eating, food labels, nutrition, and oral health. (SM)

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My Health My World.

Barbara Tharp
Judith Dresden
James Denk
Nancy Moreno

Illustrated by T. Lewis

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My Health My World®

ACTIVITIES

GUIDE FOR TEACHERS

Food and My World

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Baylor College of Medicine

SP 039 604

WOW Publications

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The activities described in this book are intended for school-age children under direct supervision of adults. The authors, Baylor College of Medicine and the publisher cannot be responsible for any accidents or injuries that may result from conduct of the activities, from not specifically following directions, or from ignoring cautions contained in the text.

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Science and Health for Kids!

These My Health My World Activities are designed to be used with:

My Health My World Adventures
The Mysterious Marching Vegetables

My Health My World Explorations
Food and My World

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The My Health My World Project at Baylor College of Medicine
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James Denk, M.A.

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About My Health My World

The My Health My World Project's exciting *Activities, Explorations* and *Adventures* link students, teachers and parents to significant knowledge of the environment and its relationship to human health. Prepared by teams of educators, scientists and health specialists, each My Health My World unit focuses on a different aspect of environmental health science. The activity-based, discovery-oriented approach of the My Health My World materials is aligned with the *National Science Education Standards* and the *National Health Education Standards.*

The three components of each My Health My World unit help students understand important health and environmental issues.

- *My Health My World Adventures* presents the escapades of Riff and Rosie in an illustrated storybook that also teaches science and health concepts.

- *My Health My World Explorations for Children and Adults* is a colorful mini-magazine full of information, activities and fun things to do in class or at home.

- *My Health My World Activities—Guide for Teachers* presents activity-based lessons that entice students to discover concepts in science, mathematics and health through hands-on activities.

My Health My World materials offer flexibility and versatility, and are adaptable to a variety of teaching and learning styles.

Where Do I Begin?

The *Adventures*, *Explorations* and *Activities* components of each My Health My World unit are designed to be used together to introduce and reinforce important concepts for students. To begin a My Health My World unit, some teachers prefer to generate students' interest by reading part or all of the *Adventures* story. Others use the cover of the *Explorations* mini-magazine as a way to create student enthusiasm and introduce the unit. Still others begin with the first discovery lesson in the *My Health My World Activities—Guide for Teachers*.

If this is your first My Health My World unit, you may want to use the pacing chart on the following page as a guide to integrating the three components of the unit into your schedule. When teaching My Health My World for 45 to 60 minutes daily, most teachers will complete an entire My Health My World unit with their students in two to three weeks. If you use My Health My World every other day or once per week, one unit will take from three to nine weeks to teach, depending on the amount of time you spend on each session.

The *My Health My World Activities—Guide for Teachers* provides background information for you, the teacher, at the beginning of each activity. In addition, a listing of required materials, estimates of time needed to conduct activities, and links to other components of the unit are given as aids for planning. Questioning strategies, follow-up activities and appropriate treatments for student-generated data also are provided. Student pages are provided in English and in Spanish. The final activity in each *My Health My World Activities—Guide for Teachers* is appropriate for assessing student mastery of concepts.

Using Cooperative Groups in the Classroom

Cooperative learning is a systematic way for students to work together in groups of two to four. It provides an organized setting for group interaction and enables students to share ideas and to learn from one another. Through such interactions, students are more likely to take responsibility for their own learning. The use of cooperative groups provides necessary support for reluctant learners, models community settings where cooperation is necessary, and enables the teacher to conduct hands-on investigations with fewer materials.

Organization is essential for cooperative learning to occur in a hands-on science classroom. There are materials to be managed, processes to be performed, results to be recorded and clean-up procedures to be followed. When students are "doing" science, each student must have a specific role, or chaos may follow.

The Teaming Up! model* provides an efficient system. Four "jobs" are delineated: Principal Investigator, Materials Manager, Reporter and Maintenance Director. Each job entails specific responsibilities. Students wear job badges that describe their duties. Tasks are rotated within each group for different activities, so that each student has an opportunity to experience all roles. Teachers even may want to make class charts to coordinate job assignments within groups.

Once a cooperative model for learning has been established in the classroom, students are able to conduct science activities in an organized and effective manner. All students are aware of their responsibilities and are able to contribute to successful group efforts.

* Jones, R. M. 1990. Teaming Up! LaPorte, Texas: ITGROUP.

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Sample Sequence of Activities, Adventures and Explorations

The components of this My Health My World unit can be used together in many ways. If you have never used these materials before, the following outline may help you to coordinate the activities described in this book with the unit's *Adventures* story (*The Mysterious Marching Vegetables*) and *Explorations* mini-magazine (*Food and My World*).

Similar information also is provided for you in the "Links" section of each activity in this book.

Activity	Concepts	Class Periods to Complete Activity	Links to Other Components of Unit	
			Adventures: *The Mysterious Marching Vegetables*	**Explorations:** *Food and My World*
1. What's That Food?	Light consists of many wavelengths.	1	Read pages 1–5.	
2. Not Just Dirt Anymore		1–2	Read pages 6–9.	*Swirled World* on page 4.
3. Lighten Up		1		*Let's Talk About the Atmosphere and Health* on pages 2–3.
4. Plant Parts You Eat		2		*Let's Talk About the Atmosphere and Health*
5. Food Webs		1		
6. Digestion and Proteins		2		
7. Bio Build-up		1		
8. They're Everywhere!		1		
9. Using Food Labels		2 or more		
10. Let's Eat 11. Healthy Snacks		1 or 2		

Using This Unit with Students at the K–1 Level

Some modifications for younger students are appropriate. To begin the unit, introduce students to the main characters in the *My Health My World Adventures* storybook. Then read the beginning of the story to the students. Follow this by demonstrating the paper-folding activity in the back of the storybook. Next, have the students do the paper-folding themselves, with a few helping hands, or make the folded items for the entire group ahead of time.

Each story session should cover only about five pages of the book, accompanied by science concepts. The mini-magazine should be incorporated as appropriate. Many of the hands-on activities in this guide are more appropriately conducted for younger children as teacher demonstrations, unless you have several helpers to assist with the activities.

Materials

You will need the following materials and consumable supplies to teach this unit with 24 students working in six cooperative groups.

Activity 1 – What's That Food?
- Four pieces of each food from the five major groups
  that can include:
  - Dairy – cheese
  - Fruit – raisins
  - Vegetables – fresh vegetables
  - Meat, beans and eggs – beef jerky
  - Grains – rice, cereal or macaroni
  - Fat and Sugar - hard candy
- 24 brown paper lunch bags
- 6 sheets of chart paper
- 24 hand lens

Activity 2 – Not Just Dirt Anymore
- 12 cups soil from yard
- newspaper to cover tables
- 24 tooth picks, coffee stirrers or popsicle sticks
- 24 hand lens
- 12 paper plates
- 6 two-liter soda bottles with lids
- 6 measuring cups
- 6 rulers
- small container alum

Activity 3 – Lighten Up
- 72 bean seeds
- 24 hand lens
- 24 sheets of paper toweling
- 24 resealable sandwich-size plastic bags
- 24 disposable cups or pots
- 24 cups of moistened potting soil
- 6 metric rulers
- 6 eyedroppers or squirt bottles

Activity 4 – Plant Parts We Eat
- 6 whole fresh fruits, vegetables and/or grains
- 6 large sheets of drawing paper
- 6 plastic knives
- 6 sets of crayons or markers

Activity 5 – Food Webs
- set of ecosystem cards

Activity 6 – Digestion
- 3 slices of turkey sandwich meat
- 6 plastic knives
- 12 resealable plastic bags
- small container of meat tenderizer

Activity 7 – Bio-Build-up
- markers

Activity 8 – They're Everywhere!
- 24 boiled potato slices
- 24 plastic resealable plastic bags
- 24 cotton swabs
- teaspoon glitter

Activity 9 – Using Food Labels
- 6 measuring cups
- 6 measuring teaspoons
- 3 cups of sugar

Activity 10 – Let's Eat
- 24 freezer-weight sandwich sandwich-size reseal-able
  plastic bags
- 12 freezer weight gallon resealable plastic bags
- 6 measuring cups
- 24 plastic spoons
- 2 cups of sugar
- 12 cups of orange juice
- 6 cups of milk
- 1 ounce unflavored gelatin, 12 teaspoons
- 5 cups rock salt

Activity 11 – Healthy Snacks

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Introduction/Pre-Assessment

What's That Food?

Background

Food gives your body the fuel and raw materials it needs each day. Just like a car needs gasoline, your body needs energy to move, think and grow. The usable energy you get from food is measured in calories. The more calories a food has, the more energy it can supply. The amount of calories a person needs depends on his or her activities. The body stores extra calories as fat.

Food provides more than just energy. It supplies the building materials, such as proteins and minerals, like calcium, for muscles, bones and other body parts. Food also has small amounts of other minerals and vitamins that help make energy available for muscles and the brain, and make other body functions possible.

No matter what your age or your lifestyle, choosing the right foods to eat can contribute to good health. The US Department of Agriculture recommends that people select a diet that includes a variety of foods in the amounts recommended on the Food Guide Pyramid (see page 3). In addition, it is important to balance the food you eat with physical activity; to choose a diet with plenty of grain products, vegetables and fruits; to choose a diet low in fat, saturated fat and cholesterol; and to choose a diet moderate in sugars and salt.

Links

This activity may be taught along with the following components of the Food and My World unit.

Adventures:

The Mysterious Marching Vegetables, "Cookies Anyone?" "Mixing It Up"

Set-up

Collect four samples of each food from the five main food groups plus candy (six total). Each group of students will receive four identical food samples in separate bags. Number four brown lunch bags as Food Group One, four as Food Group Two, etc. Place the same food in sets of the numbered bags. This could include four bags with: rice, cereal or macaroni, a dried legume like peanuts or peas, raisins or other dried or fresh fruit, beef jerky or sardines, milk or cheese, oil, hard candy and canned or fresh vegetables. If the foods are fresh or messy, you may want to place them in a sealed baggie and then into the brown bag. Students should be arranged in cooperative groups using specific job titles, Principal Investigator, Materials Manager, Recorder Reporter and Maintenance Director. See Introduction to this unit for more explanation of student roles.

Procedure

1. Divide students into groups of four. Explain to the students that

CONCEPTS

- Food comes in many forms.
- We need a minimum number of servings of certain foods and very little of others.
- There is a lot to know about healthy eating.

OVERVIEW

By observing a variety of foods, cooperative groups of students will examine what they know about food.

SCIENCE, HEALTH & MATHEMATICS

- Observing
- Recording Observations
- Predicting
- Inferring
- Drawing Conclusions

TIME

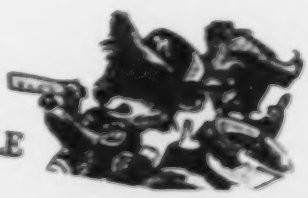
20 minutes for set-up; 45 minutes to conduct activity

MATERIALS

- A variety of foods, packaged and fresh, representing the basic food groups. Suggestions from each food group include: rice, cereal, macaroni, peanuts, beans, dried fruit, vegetables, dried meat or fish, cheese and hard candy See Set-Up
- 24 brown paper lunch-size bags

hand lens for each student
chart paper for each group

- copy of Healthy Eating page



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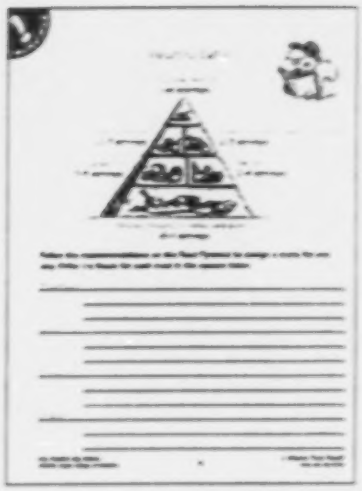
each group will be responsible for examining and reporting on a specific food item.

2. Distribute sets of numbered bags to each group, explaining that although they may recognize the food, they should not call the name out loud. It will be a mystery food for other groups to identify, based on their observations and prior knowledge.
3. Ask students to observe the food in their bag using all their senses except taste. This is a good time to encourage use of the hand lens for closer observation. Questions to ask students include: *How does it feel, sound, look, and smell? Do you recognize this food? Do you eat this food? Do you think it is good for you? How much of this type food would you need to eat daily? Where does it come from? Do we need it to live? If so, why?*
4. Have each student write down his or her observations and anything specific that he or she knows about the foods being observed. However, students should not name the food.
5. Students should share their observations within their groups. The group Recorders/Reporters should number their chart paper and list their observations. A good way for the group to share responsibilities is to let each member give an observation that the Recorder/Reporter will record. Once each observation has been shared, any other group members with the same observation will check it off their list. This will continue around the table until all or at least most of the observations are listed.
6. Have the Materials Managers place their chart paper with observations on the wall where all students are able to view.
7. Student groups should review one chart at a time and decide, based on the recorded observations, what food is being described and whether or not they agree on the other groups' answers to the questions (see step 5) regarding that food.
8. Lead a discussion based on the information on the charts with the entire group. Explain that these are all necessary foods, but that different amounts of each are recommended for optimum health.
9. Conclude by referring students to the "Healthy Eating" page. Have students identify the group on the pyramid to which each food examined in class belongs. Working in groups, have students create a menu that includes that appropriate number of servings from each of the groups.



Did you know that heat energy is measured in calories? One calorie represents the amount of heat that it takes to raise the temperature of one cubic centimeter of water (10 milliliters) one degree.

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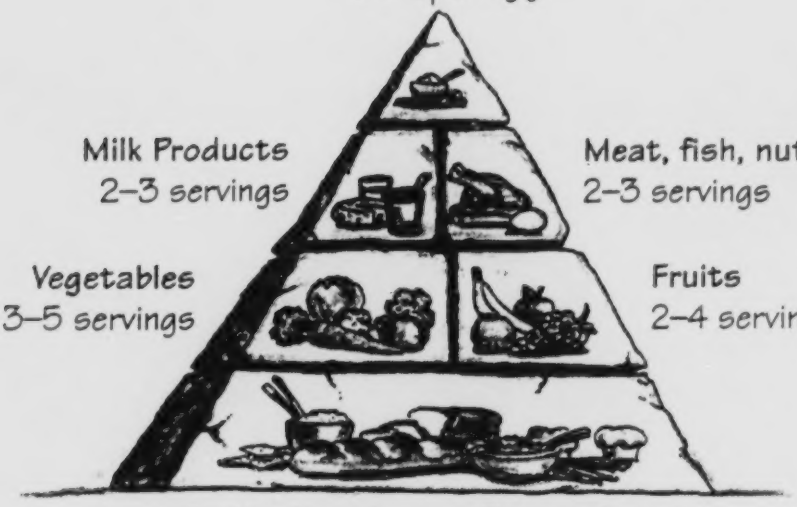
Healthy Eating



Follow the recommendations on the Food Pyramid to design a menu for one day. Write the foods for each meal in the spaces below.

Breakfast _____

_____

_____

Lunch _____

_____

_____

Dinner _____

_____

_____

Snacks _____

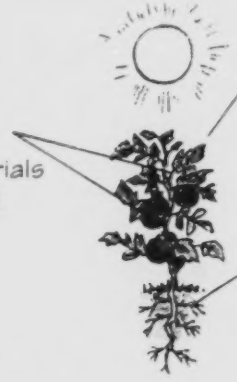
_____

_____

Physical Science Basics

Building Blocks for Food

All the food on our planet depends on the sun and on nutrients in soil and water. You may never have thought about it in this way, but the food that we and all other animals eat ultimately depends on very simple raw materials put together by green plants and their relatives.



stems provide support and transport materials up to leaves and down to roots

leaves use sunlight for photosynthesis

roots anchor the plant and take in water and nutrients from soil

All living things need energy and nutrients to grow, move and stay warm. Some are able to capture energy directly from the sun. The trapped energy is stored in food molecules like sugars and starches. Green plants, algae, seaweeds and some bacteria all are able to use energy directly from the sun to make their own food. During this process, known as photosynthesis, they use carbon dioxide from air, and water and nutrients from soil or water. Soil provides raw materials for parts of other essential molecules made by plants.

Soil consists of bits of mineral rock; pieces of animal and plant material; living things, such as bacteria, fungi, plant roots, insects and other animals; air spaces and water. Soils develop slowly over time from weathered rock and sand.

The following activity introduces students to soil, which provides two of the three building blocks for photosynthesis. The role of light, the other requirement for plant growth, is explored in Activity 3. Additional activities on light and light energy can be found in the My Health My World unit, My Home Planet Earth.

A reaction takes place any time substances come together and are transformed into new substances. The rising of a cake in the oven, the powering of an automobile by gasoline and digestion of food within our bodies all are examples of chemical reactions.

Endothermic reactions (endo = inside) require that energy be added. During photosynthesis, for example, light energy is used to power the manufacturing of sugars. Thus, photosynthesis involves a series of endothermic reactions.

Reactions that release heat are known as exothermic (exo = outside; thermic = heat). The breakdown of sugars inside our bodies to release energy is an example of an exothermic reaction. Excess energy released as heat helps keep us warm.

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2. Not Just Dirt Anymore

Background

Three simple elements are the basic building blocks of the molecules that make up our bodies, our foods and even the fuels we burn. These elements are carbon, oxygen and hydrogen. These materials are combined during photosynthesis to make energy-rich materials such as sugars and carbohydrates (starches). Plants and other plant-like things obtain hydrogen from liquid water (H_20). They obtain carbon from carbon dioxide (CO_2) gas in air. Oxygen is part of both water and carbon dioxide. However, all living things, including plants, require additional materials to carry out the chemical processes necessary for life.

Where do the other needed elements come from? Most of them are released into water from soil. Plants and plant-like organisms, such as algae, take up nutrients dissolved in water. Non-photosynthetic organisms obtain the minerals and complex molecules that they need by consuming plants and algae. Thus, the nutrients in soil are important not only for supporting plant growth, but also for assuring that other organisms are able to grow and survive.

Soil has both living and non-living components, and constantly changes through the action of weather, water and organisms. Soil formation takes a very long time—up to 20,000 years to make 2.5 cm of topsoil! This is only as deep as a quarter standing on its side!

The non-living parts of soil originated as rocks in the earth's crust. Over time, wind, water, intense heat or cold and chemicals gradually break rocks into smaller and smaller pieces. The size and mineral make-up of the tiny rock particles determine many of the properties of soil.

Most soils are enriched by the presence of decomposed plant and animal material. Soil is home to many kinds of organisms: bacteria, protozoa (small, single-celled organisms), fungi, algae (plant-like organisms that live in water or moist environments), earthworms, insect larvae, and plant roots, to name a few! Soil also contains many tiny air spaces. A typical garden soil is 25% water, 45% minerals, 5% material from living organisms, and 25% air.

Links

Adventures:

This activity may be taught along with the following components of the Food and My World unit.

The Mysterious Marching Vegetables, "Being Neighborly"

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Set-Up

You will need to have a recently dug sample of natural soil (from a field, yard, garden or the playground) for this activity. About one large shovel-full will be enough for the entire class. Collect the soil 24 hours or less before conducting the activity, and store it in a large

CONCEPTS

- Soil is a combination of many different living and non-living things.
- Soil provides raw materials needed by all living things.

OVERVIEW

Students explore a sample of natural soil by identifying and separating its different components.

SCIENCE, HEALTH & MATH SKILLS

- Observing
- Measuring
- Recording observations
- Drawing conclusions

TIME

Session one: 10 minutes for set-up; 30 minutes to conduct activity
Session two: 10 minutes for set-up; 30 minutes to conduct activity

MATERIALS

Each group will need:

- 2 cups of natural soil
- several layers of newspaper to cover work area
- toothpicks, coffee stirrers or popsicle sticks
- magnifiers (1 per student)
- 2 paper plates
- 2-liter soft drink bottle with screw-on cap
- cup for measuring
- ruler
- copy of Soil Data page

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plastic bag (do not seal completely). If the soil is very uniform, you may want to mix some light colored sand with the sample, so that students will be able to see different kinds of particles more clearly.

Each group of students will need one large-sized clear soda bottle. Have students work in groups of 2–4 to conduct the activity.

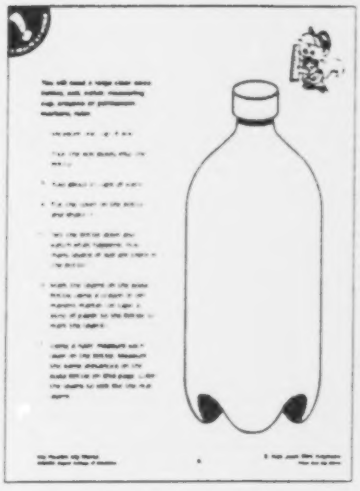
Procedure

Session One: Looking at soil

1. Direct each group of students to cover their work area with several layers of newspapers. Have one or two students from each group measure about 2 cups of soil onto a paper plate or other container.
2. Have the students in each group place about 1/2 of their soil in the center of their work area. Have them take turns describing the soil, using all of their senses. Ask, *What does the soil look like? How does it smell? Feel? How might it taste?*
3. Ask each student to write three words that describe some aspect of the soil sample.
4. Next, direct the students to spread the sample out (using toothpicks, coffee stirrers, popsicle sticks, etc.) and to look at how many different kinds of things might be making up the soil sample. Ask, *What are some of the things that you can see in the soil?* Possibilities include twigs, pieces of leaves, plant roots, insects, worms, small rocks and particles of sand. Ask, *What are some things that are in soil that we can't see?* (air, water, microorganisms).
5. Have the students make a list or draw the different things that they have been able to find in their soil samples. Suggest that they think about and classify the different components of soil as living and non-living.

Session Two: Soil Texture

1. Each group of students will need a large soft drink bottle (with cap) and the rest of their soil sample.
2. Ask students to describe the different components of soil that they investigated during the previous session. Tell them that, now, they are going to look at the make-up of soil in a different way.
3. Have each group add about 1 cup of soil to the soft drink bottle and add about six cups of water. (If students have difficulty pouring soil into the bottle, have them make a paper funnel by rolling a sheet of paper into a cone shape.)
4. Direct the students to cap the bottles tightly and shake them for about 1 minute.
5. After shaking, have them place the bottles in the center of their work area and observe the how quickly or slowly the different types of particles settle.
6. When layers are visible at the bottom of the bottle, have students



Soils usually are layered. This can be observed along the sides of new roadways or a recently dug hole. The top layer of soil consists of partially broken down plant and animal material called humus. Immediately below is a layer of soil that is enriched with tiny particles of dead plant and animal material. Next, is the first layer of mineral soil. It consists of 50-70% mineral particles combined with plant and animal (organic) material. Underneath, several more layers may be present, corresponding to mineral soils with less and less organic material. The deepest soil layers are similar to the original mineral rocks from which the soil was formed.

measure and mark the layers and draw their observed results on their "Soil Data" sheets. To facilitate measuring, you may want students to fold a sheet of paper length-wise, hold it against the side of the bottle, and mark the boundaries of each of the layers.

7. After students have completed their observations, invite the groups to share their observations. Ask, *How many different kinds of layers did you find? What was on the bottom? What was on the top?* The heaviest particles, such as sand and rocks, usually will make up the bottom layer, followed by fine sand and silt. Some clay particles are so tiny that they will remain suspended in the water. Plant and animal material also may remain floating at the top of the water. You also might ask, *Of what do you think soil is mostly made?*

Variations

• Create different soil samples for each group by mixing different amounts of soil and sand from different sites. Have students compare their results and discuss which samples might be the best to use in a vegetable garden. Have them test their predictions by putting the different kinds of soils in pots or cups and planting flower or vegetable seeds in each one.

• Provide samples of pure sand and pure dry clay for students to examine with their magnifiers. Have them write about the difference.

• Have students plant seeds in garden soil and in pure sand, predict what might happen, and observe plant growth in the two planting media.

• Try making your own pH paper to test soil acidity. Place about 1 cup of sliced purple cabbage into a sealable bag with warm distilled water. When the water is dark blue or purple, pour it into a container. Cut coffee filters into one inch strips. Dip the strips into the cabbage water and allow them to dry on a hard surface. Test the pH strips in vinegar (weak acid) and water with baking soda (base) to see how they change color. Measure 1/2 cup of soil into 2 cups of distilled water. Test the water using the pH strips. Compare several soils from different locations.

Questions for Students to Think About

• Nitrogen is very important for living organisms. It is found in proteins and in DNA (hereditary material in cells). Surprisingly, however, only a few organisms can use the abundant free nitrogen present in air. Most of these nitrogen-trapping organisms are bacteria that live in soil or in water. All other living things, including plants, depend on forms of nitrogen produced by nitrogen-trapping bacteria. Some nitrogen-trapping bacteria even work as partners with plants. They form special swellings or nodules in the roots of certain plants. This is especially common among members of the bean family (also known as legumes). See what you can find out about the partnership of these kinds of plants with bacteria.

The non-living part of soil is made up of different sized particles of rocks and mineral.. Different size classes of soil particles have different names.

- Sand (2–0.2 mm in diameter) consists of the largest size particles. A large amount of sand makes a soil feel gritty.
- Fine sand (0.2–0.02 mm in diameter) feels less gritty than sand, but the particles still can be seen without a magnifier.
- Silt (0.02–0.002 mm in diameter) feels powdery. You need a magnifier to see the individual particles.
- Clay (less than 0.002 mm in diameter) particles are so tiny that they cannot be observed even with the low power of a light microscope. A large amount of clay makes a soil feel sticky. Sometimes you can even shape or mold it!

The best soils for growing plants have a mix of particle sizes and also have considerable amounts of dead plant and animal material. Soils like this have many nutrients and help hold water for plants.

Water in soil is present primarily as a film on the surfaces of soil particles.

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Soil Data

You will need a large clear soda bottle, soil, water, measuring cup, crayons or permanent markers, ruler.

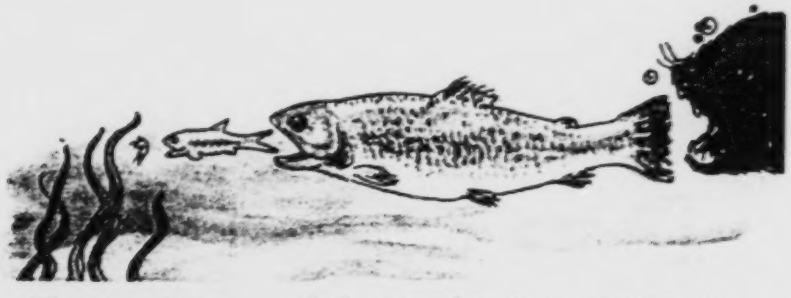
1. Measure one cup of soil.
2. Pour the soil slowly into the bottle.
3. Add about 6 cups of water.
4. Put the cover on the bottle and shake it.
5. Set the bottle down and watch what happens. *How many layers of soil are there in the bottle?*
6. Mark the layers on the soda bottle using a crayon or permanent marker (or tape a strip of paper to the bottle to mark the layers)
7. Using a ruler, measure each layer on the bottle. Measure the same distances on the soda bottle on this page. Color the layers to look like the real layers.

Biology Basics

Food and Energy in Living Things

Living things often are classified as producers or consumers depending on how they obtain energy and nutrients to survive. Producers are able to make the molecules they need from relatively few substances present in the air, water and soil. On land, green plants are the primary producers. In water, some plants and many different kinds of algae, bacteria and other one- to many-celled organisms (Protists) are producers. All other organisms are consumers, who live directly or indirectly on food provided by producers.

Almost all producers make the molecules they need through photosynthesis. During photosynthesis, producers absorb energy from the sun and use it to combine carbon from carbon dioxide with water to make sugars and carbohydrates. Thanks to this amazing process, light energy from the sun is converted into chemical energy stored in the bonds between atoms that hold molecules together. Plants use the energy stored in these molecules to build other compounds necessary for life. Likewise, consumers, who cannot trap energy directly from sun, must rely on molecules manufactured by plants for food.



The general sequence of who eats whom in an ecosystem is known as a food chain. Energy is passed from one organism to another at each step in the chain. Along the way, much energy also is lost as heat. In general, about 85-90% of the total usable energy is lost at every step in a food chain. Most organisms have more than one source of food, so all of the energy-flow interactions that happen in an ecosystem usually are described as a food web.

Some specialized bacteria can make the nutrients they need without sunlight. Bacteria that live in hot deep-sea vents obtain energy through the chemical break-down of hydrogen sulfide into elementary sulfur. In soil, some bacteria combine nitrogen- or iron-containing compounds with oxygen and capture the energy that is given off by these reactions.

HERBIVORES *are primary consumers and feed on plants and other producers. Giraffes and caterpillars are primary consumers.*

CARNIVORES *are secondary consumers and feed on primary consumers. Most secondary consumers are animals, but a few are plants. Anteaters and spiders are secondary consumers.*

OMNIVORES *eat plants and animals. Humans, pigs, dogs and cockroaches all are omnivores.*

DECOMPOSERS *live off waste products and dead organisms. Many kinds of bacteria and fungi (molds and mushrooms) are decomposers. The decomposers themselves are important food sources for other organisms in soil such as worms and insects. Litter-feeders, such as termites and earthworms, feed on partially broken down bits of plant and animal matter.*

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3. Lighten Up

Background

Green plants and other photosynthetic organisms form the basis of almost all food chains on our planet. Only they are capable of trapping light energy from the sun and transforming it into chemical energy that can be used by cells. Very few raw materials are necessary for photosynthesis. Green plants need only water (H_2O) and carbon dioxide (CO_2), in the presence of sunlight (or artificial light that mimics sunlight), to manufacture carbohydrates. The energy held in carbohydrates is used by plants to fuel other chemical reactions and to make all of the other molecules necessary for life. Some of these molecules require other substances that must be taken in by plants, including:

- nitrogen (important for making proteins),
- phosphorous (important for energy transformations in cells),
- potassium (helps make proteins, controls the opening of pores in leaf surfaces),
- calcium (important for many functions of cells, in bones of animals),
- magnesium (part of the chlorophyll molecule),
- sulfur (in some proteins),
- iron (necessary for making chlorophyll and other molecules; also in hemoglobin in animals), and
- other minerals from soil in tiny amounts.

Links

This activity may be taught along with the following components of the Food and My World unit.

Adventures:
The Mysterious Marching Vegetables, "Vegetable Wonders"

Set-up

You will need about 4 cups of rich garden soil or purchased potting soil for each group of four students. Moisten the soil before using by placing it in a plastic bag and adding water until the soil is damp, but not dripping wet. Let the moistened soil sit for 1/2 to 2 hours before use.

You may use small plastic pots (such as those used in nurseries) or prepare your own, using disposable plastic or foam cups. Punch one or more holes for drainage in the bottom of the cups. Once students have planted their seeds, set the cups on plastic or foil trays near a light source.

Procedure

Session One: Soaking seeds

1. Give each group 12 or more bean seeds and 4 magnifiers. Have the students use their magnifiers to observe the bean seeds. Each

CONCEPTS

- Plants require light, water and soil to grow.
- Light is necessary for the production of new plant material.

OVERVIEW

Students learn about plant growth and development by conducting an experiment that demonstrates the importance of light to plants.

SCIENCE, HEALTH & MATH SKILLS

- Observing
- Recording observations
- Measuring in centimeters
- Comparing measurements
- Graphing measurements
- Interpreting results
- Drawing conclusions

TIME

Session one: 30 minutes;
Session two: 30 minutes, 10–20 minutes each day for 1–2 weeks;
Session three: 30 minutes;
Session four: 30 minutes

MATERIALS

Each group will need:

- 12 bean seeds
- 4 magnifiers
- 2 sheets of paper toweling
- resealable sandwich-size plastic bag
- 4 disposable cups or pots
- 4 cups moistened potting soil
- metric ruler
- eyedropper or squirt bottle
- copies of Data Sheet and Plant Growth Sheet

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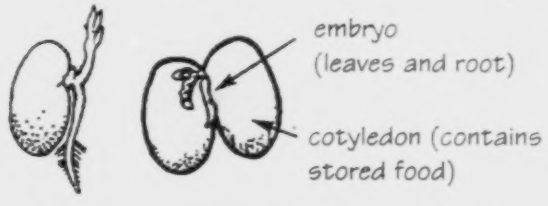
student should draw a seed on his or her "Data Sheet." Make sure that each student is able to observe the seed coat and the dark indentation on one side of the seed corresponding to where the new plant will emerge.

2. Have the Materials Managers pick up two paper towels and a sandwich-size resealable plastic bag from a central location.
3. Let each group label its bag.
4. Have another member of each group moisten the towels in a tray or bowl of water that you have set out. Make sure that they squeeze excess water from the towels. Direct the students to fold or wrinkle the paper towels and to place them inside the plastic bags. Next have them place the bean seeds inside the plastic bag, resting them on or inside the wet towels.
5. Leave the bags somewhere in the classroom until the next day.

Session Two: Planting seeds

1. Before proceeding with planting, have each student observe a soaked seed. They should compare the soaked seeds to the dry seeds. Ask, *How is the soaked seed similar to the dry seed? How is it different?* Have students remove the "skin" (seed coat) and spread the pieces of the tiny plant inside apart. They will be able to identify the cotyledons (seed leaves), other tiny leaves and the beginnings of what will become the plant root.



2. Have Materials Managers pick up four disposable cups or pots from a central location in the classroom (make drainage holes in bottoms of cups in advance; see Set-up). Direct the members of each group to pick a name for their group and to write it on each of the cups. They also should number their cups: 1, 2, 3 and 4.
3. Place one or more containers of previously moistened potting soil (see Set-up) in a central location. Have two students from each group fill the groups' cups about 3/4 full of potting soil.
4. Direct the students to make two indentations in the surface of the soil in the pots (about 1/2 cm deep) and to place one seed in each hole. Have them cover the seeds lightly with additional soil. Each group will have four pots with two seeds in each pot.
5. Have students place the pots on trays near a bright, sunny window or under a fluorescent light.

Over the next several days . . .

1. Once the seeds sprout, have the students remove and discard seedlings as necessary to leave only one plant per pot.

Within plant cells, photosynthesis takes place in specialized structures known as chloroplasts. Scientists believe that chloroplasts originated as free-living photosynthetic bacteria that became introduced inside the cells of other organisms. A square millimeter of leaf may contain as many as 500,000 chloroplasts!

Flowering plants are divided into two groups, based partially on the structure of their seeds. Plants with two cotyledons in the seed are called dicotyledonous plants or "dicots." Beans, roses, daisies and oaks all are examples of dicots. Monocotyledonous plants or "monocots" have seedlings with one initial leaf. Grasses, sedges, lilies and orchids all are monocots.

Elaborate equipment is not necessary for growing plants in the classroom. If you do not have a window with bright light, place pots under a fluorescent lamp. Allow only about 5 inches from the tops of the pots or growing plants to the light source. Inexpensive fluorescent lamps that are appropriate for growing plants often are sold in hardware stores as "shop lights."

2. Have them measure the plants every day and record the height in cm on their Data Sheets.
3. Let students water the plants every day or two with an eyedropper or squirt bottle. The soil should be moist but not wet.

Session Three: Light Experiment

1. When most of the seedlings are approximately 10 cm tall, explain to the students that they will now investigate the effect of light on the growth of the bean plants. Ask, *Do you think that the plants need light to grow? What do you think will happen if we give some of the plants less light?*
2. Have each group move pots 3 and 4 to a new location in the classroom that you have selected (in the back of the classroom or in a dark corner away from the windows or light source). Ask, *Do you think that the plants in the new place will have as much light as the others? Why or why not? What do you think will happen?* Have students predict the results.
3. Have the students continue to measure the height of the plants for another 5–10 days. Have them use a different color to record the measurements of the plants in pots 3 and 4, after they were moved to the new location.

Session Four: Looking at Data

1. Distribute a copy of the "Plant Growth Sheet" to each group. Help the students color the numbers of squares corresponding to the recorded heights of plants in pots 1, 2 ,3, and 4 on the day before pots 3 and 4 were placed in the darker part of the room.
2. Next, have the students color the numbers of squares corresponding to the heights of the plants in pots 1, 2, 3 and 4 on the last day they made a measurement.
3. Let them compare the results. Ask, *Were the plants all about the same size before you moved pots 3 and 4 out of the bright light? Are all the plants still the same size? Why do you think that is so? Are there any other differences other than size?* Help students to conclude that the differences in growth (the plants with less light will have grown less or will have developed tall narrow stems) and in color (the plants with less light will be lighter green in color) were caused by the differences in the availability of light. *What is the only thing that was different about the two sets of pots?* (Only the amount of light changes; all other aspects of the experiment—water, soil, seedlings, pots, planting method—were unchanged for both groups.)
4. Ask, *Where do you think the plants in pots 1 and 2 got the materials and energy to produce more stems and leaves? What were the plants in pots 3 and 4 missing? What do you think would happen if we put the plants in pots 3 and 4 back in the light?*

Plants growing in dark conditions sometimes will develop tall spindly stems. This process, called etiolation, is a result of plants' using their energy to grow upward in search of light.

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Variations

- Help students "see" chlorophyll, the pigments that are

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essential for converting light energy into chemical energy (food molecules), by placing a handful of crushed fresh leaves (any kind) in a clear container with about 2 cm of rubbing alcohol. Stir briefly and insert the tip of a strip of coffee filter paper in the alcohol. The pigments will travel up the paper strip and form a green band that will be visible after about 1/2 hour. This way of separating chemicals in solution is known as paper chromatography. (See My Health My World, *Water and My World,* Activity 8, "Separating Solutions," for more information about chromatography.)

Safety Note. Make certain area is well ventilated and have students wear protective eyewear. Do not use alcohol near an open flame.

Questions for Students to Think About

- How might you change this experiment to look at the effects of different amounts of water on plant growth or the addition of fertilizers to plants? Which parts of the experiment would you change? Which parts of the experiment would you leave the same?

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Data Sheet

Draw a picture of a dry bean seed.

Draw a picture of a bean seed after soaking.

Draw a picture of the insides of the soaked bean seed.

Draw a picture of a bean seedling.

Measure the height of the seedling in each of the pots every day. Write the measurements in the spaces below. Use a different color to write the heights of the plants in Pots 3 and 4 after you have moved them to a dark place.

Date	Pot 1	Pot 2	Pot 3	Pot 4

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Plant Growth Sheet

How tall was each plant just before you moved plants 3 and 4. Write the height of each plant below.

FIRST PART

Plant 1	Plant 2	Plant 3	Plant 4
_____	_____	_____	_____

How tall was each plant at the end of the experiment. Write the height of each plant below.

SECOND PART

Plant 1	Plant 2	Plant 3	Plant 4
_____	_____	_____	_____

Use red to color the same number of squares as the number of centimeters that each plant grew during the first part of the experiment Start at the bottom.

Use blue to color more squares up to the number of centimeters that each plant grew during the second part.

Plant 1	Plant 2	Plant 3	Plant 4
20	20	20	20
19	19	19	19
18	18	18	18
17	17	17	17
16	16	16	16
15	15	15	15
14	14	14	14
13	13	13	13
12	12	12	12
11	11	11	11
10	10	10	10
9	9	9	9
8	8	8	8
7	7	7	7
6	6	6	6
5	5	5	5
4	4	4	4
3	3	3	3
2	2	2	2
1 cm	1 cm	1 cm	1 cm

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4. Plant Parts You Eat

Background

Only producers, such as green plants, are able to make the molecules that they need for life from simple compounds in the air, soil and water. Almost all producers use energy from the sun to achieve this through photosynthesis. All other living things on the planet depend on producers for food. Food provides energy and important nutrients needed by cells.

Primary consumers feed exclusively on plants and other producers. Omnivores eat plants and animals. Most humans are omnivores. However, some people chose to eat only foods that come from plants. Plant-based foods supply vital nutrients that our bodies cannot make for themselves. These nutrients include vitamins, which are chemicals that are necessary for the proper functioning of the body; carbohydrates and sugars, which provide energy; amino-acids, which are the building blocks of proteins; oils, another concentrated energy source; and minerals, such as potassium, magnesium and calcium.

Humans use a remarkable variety of plants and plant parts as food. However, agriculture—the cultivation of plants—is a relatively recent innovation in human history. Many historians believe that farming of plants began about 10,000 years ago in several different parts of the world. The plants that we use today as food are very different from their wild ancestors. Most food plants evolved through selection by many generations of farmers to produce larger fruits, grains, and other edible parts, and to be easier to plant, harvest, and process. The wide variety of foods that we commonly eat also originated in many different and geographically separate parts of the world.

Many foods come from plant roots. Important root crops include carrots, parsnips, beets, sweet potatoes, radishes, rutabagas and turnips. Potatoes, which develop underground, technically are stems that have been modified for the storage of starches. Other stems that are used as food include sugar cane and asparagus.

Leafy foods include chard, spinach, lettuce, brussels sprouts, cabbage, collards and kale. All of these look like leaves. However, foods that come from bulbs, such as onions, leeks and garlic, also are made of leaf parts (the enlarged bases of long, slender leaves). Celery and rhubarb stalks actually are the supporting stems (petioles) of leaves.

Flowers are not eaten frequently, but cauliflower, broccoli and artichokes all are made up of flowers. On the other hand, fruits and seeds, which develop after flowers are pollinated, are significant food sources. Fruits include familiar foods such as oranges, lemons, grapefruit, limes, apples, peaches, pears, grapes, melons, cherries, plums, tomatoes, all squashes, blueberries, green beans

CONCEPTS

- Consumers depend on producers for food.
- People rely on many different plants and plant parts for food.

OVERVIEW

Students observe different plant-originated foods.

SCIENCE, HEALTH + MATH SKILLS

- Observing
- Recording observations
- Using evidence
- Drawing conclusions
- Using resources to find information

TIME

10 minutes for set-up; 30 minutes to conduct activity

MATERIALS

Each group will need:

- 1 whole fruit, vegetable or grain (see Set-Up)
- large sheet of drawing paper
- plastic knife
- crayons or markers

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and chile peppers. Mangos, bananas, avocados, figs, breadfruit, eggplant, cucumbers, guava, pomegranates, dates, papaya, olives and zucchini also are fruits,

Seeds frequently contain stored food resources (carbohydrates, oils, proteins) to fuel growth of the tiny plant each contains. Important seeds that we eat are beans, peas, lentils and chickpeas. All of these are members of the bean or legume family. Food in these seeds is stored in the fleshy leaves (cotyledons) of the plant embryo. Many nuts consist of seeds or parts of seeds. Examples are walnuts, pecans, almonds and peanuts.

Grains, considered to be among the first cultivated crops, are the small, dry fruits of members of the grass family. Grains look and behave very much like individual seeds. The commonly cultivated food grasses are called cereals, after the Greek goddess Ceres. Major grain crops include barley, millet, oats, rice, rye, sorghum, wheat, and corn (maize). Rice, probably the most important grain, is the primary food source for more than 1.6 billion people.

Links

This activity may be taught along with the following components of the Food and My World unit.

Adventures:

The Mystery of the Marching Vegetables, "A Crunchy Lunch" "Picking a Plan"

Set-up

You will need to bring enough different fruits, vegetables and grains to class to provide a different one to each group of 2-4 students. Try to include at least one representative from each of the following categories: roots, stems, flowers, fruits, seeds, and grains. Fresh or whole examples are best. Appropriate selections include roots such as carrot, beet, radish, and sweet potato; stems such as asparagus (potato is a confusing example, save to discuss with students afterwards); flowers such as broccoli or cauliflower; leaves such as lettuce, spinach, celery, scallions (students can observe that the fleshy bulb of the scallion or green onion is made up of overlapping leaf bottoms); fruits such as apple, orange, peach, tomato, zucchini; seeds such as dried beans or lentils; whole grains such as popcorn or wheat berries (white rice has most of the grain removed). Soak examples of grains and dried seeds overnight, so that they will be soft enough for students to split open.

Procedure

1. Help students remember basic plant parts by referring to a plant in the classroom or school yard as an example. Ask questions such as, *Why are green plants special?* (make food through photosynthesis); *Where do plants trap sunlight to make food?* (leaves); *Where do plants take in water and nutrients that they need?* (roots); *How can we get more plants?* (planting seeds or other reproductive parts of plants, such as stem sections);

Possible Origins of Flowering Food Plants

Site of Origin	Common Name
China (Asia)	Buckwheat
	Oranges
	Peaches
	Soybeans
	Tea
India/Malaysia (Asia)	Bananas
	Breadfruit
	Chickpeas
	Mangos
	Black pepper
	Rice
	Safflower
	Sesame
	Sugar cane
	True yams
Central Asia	Apples
	Carrots
	Grapes
	Onions
	Peas
	Pears
	Radish
	Spinach
Near East	Figs
	Lentils
	Melons
	Oats
	Rye
	Wheat
Mediterranean	Asparagus
	Beets
	Cabbage
	Leek
	Lettuce
	Olives
Africa	Barley
	Coffee
	Millet
	Okra
	Sorghum
Mexico/Central America	Avocado
	Beans
	Cacao
	Corn
	Sweet potato
	Chile pepper
	Winter squash
South America	Peanuts
	Pineapple
	Potato
	Tomato

Where do seeds come from? (flowers, which develop fruits and seeds).

2. Follow by having students think about all the foods that they have eaten that day that came from plants. Examples might include bread from wheat, cereals from oats, wheat and corn, juice from oranges and apples, etc. Ask, *Did you know that we eat many different parts of plants?*
3. Give each group of students a sheet of drawing paper and one of plant foods that you have brought to class. Direct students to fold the sheet in fourths, creating four spaces in which to record information.
4. Provide each group with one of the plant foods you have brought to class and a plastic knife. Give students an opportunity to observe and discuss their item briefly before continuing.
5. Have each group provide the following information in the four squares on their sheets. In the first square, students should write a description and/or draw the outside of the food. Before filling in the second square, direct students to cut their food in half or in several pieces, so that they can observe the interior. Have them write a description and/or draw the inside of the food in the second square.
6. Based on their observations, have students describe what plant part or parts is represented by the food in the third square. They should report the observations they used to reach their conclusions (for example, carrots have fine roots still attached to the large central root, some students may have observed that carrots grow underground, etc.).
7. In the final square, have students report different ways to prepare and eat the food. You may want to spend an extra class period on this step to allow students time to visit the library or to access the Internet to gather additional information.
8. Have each group share the information about its plant food with the rest of the class. You may want to contribute some fun facts about plant parts and food, such as: potatoes are stems, not roots (we know this because a potato in water will produce leaves at the top and roots at the bottom); artichokes are similar to huge sunflower buds; pineapples consist of the fleshy stems and flowers of a tropical plant.

People who follow a vegetarian or modified vegetarian diet have to make special efforts to eat foods with enough protein. Not all plants supply the same building blocks for proteins (amino acids), so a mixture of proteins sources is vital. Good vegetable sources of protein are peanuts, beans, lentils, chickpeas, and peas.

Variations

• Push toothpicks into the side of a potato and suspend it in a glass of water. Students will be able to observe the formation of stems, leaves and roots.

• Food crops have originated in many different parts of the world. Scientists have had to estimate where each crop originated by using archeological evidence and by locating where wild relatives of the food crop still grow. Using the library or the Internet, have students investigate the places of origin of some common foods.

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5. Food Webs

Background

Ecosystems are composed of many different kinds of organisms, which obtain their food in a variety of ways.

- *Producers* make the molecules that they need from simple compounds, using energy from the sun (photosynthesis).
- *Primary consumers* (herbivores) feed on plants and other producers.
- *Secondary consumers* (carnivores) feed on primary consumers. Most secondary consumers are animals, but a few are plants, which trap and digest insects.
- *Tertiary consumers* (top carnivores) feed only on animal-eating animals.
- *Omnivores* eat plants and animals. Pigs, dogs, humans and cockroaches all are omnivores.
- *Decomposers* live off waste products and parts of dead organisms by breaking large molecules into smaller ones and absorbing nutrients that are released. Many kinds of bacteria and fungi (mostly molds and mushrooms) are decomposers. The decomposers themselves are important food sources for other organisms that live in soil, such as worms and insects.
- *Litter-feeders,* such as carpenter ants, termites and earthworms, feed on partially broken down bits of plant and animal matter.

The general sequence of who eats whom in an ecosystem is known as a food chain. Energy is passed from one organism to another at each step in the chain. Most organisms have more than one source of food, so all of the energy-flow interactions that happen in an ecosystem make up what usually is called a food web.

This activity lets students construct possible food webs in different ecosystems, as they learn about the role of different kinds of organisms in ecosystems.

Links

This activity may be taught along with the following components of the Food and My World unit.

Adventures:
The Mysterious Marching Vegetables, "Night Watch"

Set-up

You will need to make copies of the Ecosystem Cards for students in advance. Six sets of cards are provided: freshwater marsh, temperate forest, desert, ocean, rain forest, grassland. Each group of students will receive the cards corresponding to one ecosystem. Have 2–4 students work together as teams for this activity.

CONCEPTS

- Producers make all the molecules they need from simple substances and energy from the sun.
- All other living things depend on producers for food.
- Living things that must eat other organisms as food are known as consumers.
- Food webs show all of the different food interactions in an ecosystem.

OVERVIEW

Students construct possible food webs for six different ecosystems.

SCIENCE, HEALTH & MATH SKILLS

- Inferring
- Integrating information
- Drawing conclusions

TIME

10 minutes for set-up; 30–45 minutes to conduct activity

MATERIALS

Each group will need:
- set of Ecosystem cards representing one ecosystem
- copy of EcoSystems page

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Procedure

1. Give each group of students a set of Ecosystem Cards representing one environment. Each set consists of six cards representing producers, consumers and decomposers.
2. Have the students spread the cards in the center of their working area, and read the information about each of the organisms depicted on the cards. Have the students take turns reading the cards to one another.
3. Ask each group to decide which organisms use energy from the sun to produce food. Mention that these are "producers." *Producers* provide food for themselves and for other organisms. Next, have the members of each group identify which organisms might eat the producers as food. *Consumers* eat other organisms for food. Finally, have students identify which organisms in their ecosystem help break down dead organisms. *Decomposers* obtain their food from plants and animals that already are dead. Decomposers help make nutrients available in the soil again.
4. Once students have identified the producers, consumers and decomposers of their ecosystem, have them discuss the different ways in which their six organisms might be related in a food web. The best way to do this is to have them organize the cards by "who eats whom." Students should be aware that an organism may serve as food for more than one consumer.
5. Have each group summarize their ecosystem food web by writing the names of the six organisms on the "EcoSystems" page and by drawing lines to connect the different producers, consumers and decomposers in the system. Most students will find that there are many different ways to connect even as few as six organisms within an ecosystem.
6. Encourage students to think about the complex relationships among the different living things in an ecosystem by asking questions such as, *What would happen if there were no producers in your ecosystem? No decomposers? Where would humans fit in a food web? Do we also depend on many different plants and animals? What do you think your food web would look like if all of the organisms in your ecosystem were included?*

Variations

• Have students (individually or in groups) create drawings of their ecosystems, including the organisms that they used to construct their food webs.

• Have students conduct additional research about the ecosystems and/or organisms that they used for the food webs by consulting resources available at the library, through the Internet or available as CD ROM software.

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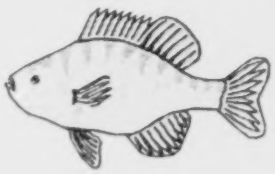
EcoSystem Cards—Set 1

Freshwater Pond

BLUEGILL. The bluegill is a silver-blue fish with brown stripes. It likes to lay its eggs in the mud at the bottom of ponds. Blue gills eat insects, snails, tadpoles and even small fish.



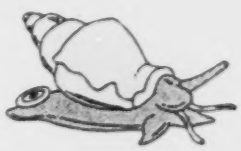
HERON. The heron is a white bird that has long, slim legs, because it likes to wade in the water looking for food. Herons catch many kinds of small animals with their long beaks.

GREEN ALGAE. Most ponds have green scum on top. This green scum is made of millions of tiny algae. Algae use energy from the sun to make their food.

NYMPHS. Dragonflies lay their eggs in water. The young insects that hatch are called nymphs. The nymphs eat small animals at the bottom of the pond.

ROTIFER. Rotifers are tiny swimmers. They have fine hairs that help them swim. Rotifers eat algae and other very small organisms in water.

SNAIL. Snails carry their shells on their backs. Snails eat bits of dead plants and animals and parts of water plants.



EcoSystem Cards—Set 2

Temperate Forest

BLACK BEAR. Black bears like to eat berries, acorns and even insects.

EARTHWORM. The earthworm burrows through soil and eats bits of dead plant material along the way.

FOX. Foxes are able to run quickly through the forest. They hunt small animals for food.

OAK TREE. The are several kinds of oak trees in the temperate forest. Oak trees are very tall and have leaves that turn bright red and orange in the fall. The nuts of oak trees are called acorns. Many different animals eat acorns.

RASPBERRY. Raspberry bushes grow in clearings and at the edge of the forest. Many animals like to eat the sweet berries.

SQUIRREL. Squirrels are good climbers and build their nests in trees. They often eat acorns and other kinds of nuts.

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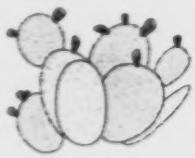
EcoSystem Cards—Set 3

Sonoran Desert

DESERT GRASSES. Many grasses grow in the desert. Some of them grow and make seeds after a good rain.

KANGAROO RAT. This rodent borrows in the ground and is a good jumper. It sleeps during the day and comes out at night when the air is cooler. It eats seeds and some insects.

PRICKLY PEAR CACTUS. The Prickly Pear has round, flattened stems that look like big leaves. The stems are prickly outside and soft and juicy inside. The Prickly Pear also has sweet, juicy fruits and seeds that can be eaten.



RATTLESNAKE. Rattlesnakes live in low parts of the desert. They are able to slide sideways over sand. Rattlesnakes eat rodents and lizards.

ROADRUNNER. This striped bird can run very quickly to chase prey and escape predators. It eats other animals, like snakes, insects and scorpions.

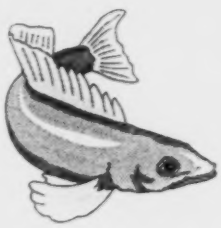
TERMITE. Termites are insects live in large groups called colonies. They build large mounds in the ground in which to live. Termites eat tough dead plant material.

EcoSystem Cards—Set 4

Ocean

CRAB. Crabs are animals with a hard shell and legs with joints. They have two claws that they use for hunting small animals for food.

GRAY SNAPPER. Gray Snapper is an ocean dwelling fish with a muscular, streamlined body. It eats crabs, small shrimp and squid.

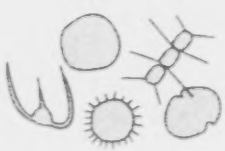


HERRING GULL. This medium-sized white and gray bird has webbed feet so that it can swim. It eats small fish and small sea animals with shells.

LUGWORM. Lugworms are ocean-living worms that feed on the remains of plants and animals.

MUSSEL. Mussels are animals with two-part shells. They attach themselves to rocks and feed on tiny plants and animals in water.

PLANKTON. Plankton is made up of tiny plants and animals that swim in ocean water. Many kinds of plankton are green and are able to use energy from the sun to make food.



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EcoSystem Cards—Set 5

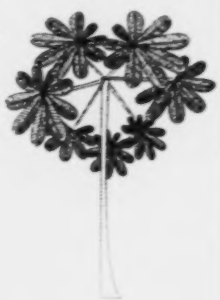
American Rain forest

ANTEATER. Anteaters are animals that are related to possums. They have long noses, no teeth and sharp claws.

AZTECA ANTS. These ants like to live inside hollow stems. They use nectar for food.

BATS. Tropical bats look for nectar and pollen to eat from trees that flower at night.

CECROPIA TREE. The Cecropia Tree has several hollow stems, and leaves that look like umbrellas. Each leaf produces nectar. The Cecropia produces thousands of fruits.



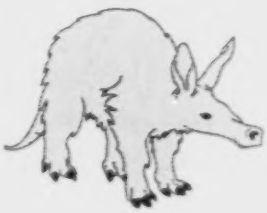
FUNGUS. Many kinds of fungus break down dead trees and other plants on the damp forest floor.

KAPOK TREE. This is a very tall tree that grows on the edges of forests. The flowers open only at night and produce nectar and pollen.

EcoSystem Cards—Set 6

African Grasslands

AARDVARK. The aardvark is an African anteater. It has a long nose just like the American anteater.



GRASSES. Many kinds of grasses grow on the rich soils of East Africa. They are food for many different animals.

LIONS. Lions live in groups. Female lions are hunters. They catch other animals for food.

TERMITES. African termites are insects that build large houses above the ground. Termites eat dead plants, or use them to grow fungus to eat.

VULTURE. Vultures are large birds with curved beaks. They eat the remains of dead animals.

WILDEBEEST. A wildebeest is a kind of antelope. It can run quickly and has long curved horns. Wildebeests eat grass.

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EcoSystems

Write the names of the animals and plants in your ecosystem on the lines below. Draw a circle around the names of the consumers in the ecosystem. Draw lines to connect each consumer to its food sources.

_____ _____

_____ _____

_____ _____

6. Digestion

Background

Food must be broken down, both physically and chemically, before it can be used by the cells within an organism. The process of breaking food down into usable components is known as digestion. Within the human body, digestion begins in the mouth, where food is taken in. Within the mouth, pieces of food are mechanically broken into smaller pieces. In addition, saliva, which softens and begins to break food down, is mixed with the pieces created by chewing. The other components of the digestive system—esophagus, stomach, small intestine, large intestine, liver and pancreas—continue the process of reducing food to molecules small enough to be used by cells in the body for energy and as building blocks for other molecules.

The stomach serves as a powerful mixing machine in which food is combined with special chemicals (enzymes) that begin to break large food molecules into smaller ones. Food usually stays in the stomach for two to three hours. Food exits the stomach and passes into the small intestine where it is combined with secretions from the liver and pancreas. These very important organs produce substances (bile from the liver and pancreatic fluid from the pancreas) that help break down fats, proteins and carbohydrates into smaller molecules. The small intestine is responsible for absorbing the nutrients released during digestion. The walls of the small intestine are covered with millions of tiny, finger-like projections called villi. These structures increase the surface area of the small intestine to facilitate the absorption of nutrients into the bloodstream.

Proteins, and their building blocks (amino acids), are vital to every cell in the body. Humans are not able to make their own amino acids, so they must include at least a small amount of protein (equivalent to about 4 oz of chicken white meat) in their daily diet. During digestion, the proteins in food are split into the different amino acids of which they are made. Then the body builds new proteins from the amino acids. You might say that the amino acids are recycled!

This activity will allow students to observe how proteins are broken down by chemicals in the body.

Links

This activity may be taught along with the following components of the Food and My World unit.

Adventures:

The Mysterious Marching Vegetables "What to Do?"

Set-up

You will need to purchase meat tenderizer (located in the spice

CONCEPTS

- Food must be broken down into smaller units before it can be used inside the body.
- Digestion is the process of breaking food down.
- Special chemicals in the body break food molecules into smaller units.
- Proteins—found in all meats, dairy products and vegetables (especially peas and beans)—are important for muscles and cell growth and repair.

OVERVIEW

Students learn about digestion and proteins by observing the action of meat tenderizer on luncheon meat.

SCIENCE, HEALTH & MATH SKILLS

- Predicting
- Making qualitative observations
- Drawing conclusions

TIME

10 minutes for set-up; 30 minutes to conduct activity

MATERIALS

Each group will need:

- 1/2 slice of turkey sandwich meat
- plastic knife
- 2 resealable plastic bags
- 1/2 teaspoon meat tenderizer

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section) at the grocery store for this activity. You also will need a piece of sliced turkey luncheon meat for each group. Have students conduct this activity in groups of 2–4.

Procedure

Session One: Setting up

1. Let Materials Managers collect 1/2 slice of turkey sandwich meat, plastic knife and two resealable plastic bags. Have the groups label the bags "1" and "2."
2. Have the students in each group cut the piece of turkey in half and place one section in the bag labeled "1." Direct them to place the other section in bag "2" and to add 1/2 teaspoon of meat tenderizer to that bag. Have them seal the bag and move the turkey slice within the bag so that it is well coated with the tenderizer.
3. Have the students place the bags to one side in the classroom for about an hour. (If students will be making observations on the following day, refrigerate the bags to prevent spoilage.) Have students write what they predict will happen to the slices of turkey in their bag.

Session Two: Making observations

1. Have students observe the texture and color of the meat samples without removing them from the plastic bags. Ask, *Is there anything different about the turkey that was combined with the meat tenderizer? What do you think happened?*
2. Ask students to think about what might have happened to the turkey slices. Mention that the substance that they added was a chemical that helps soften the muscle fibers in meat and begin to break them down into smaller pieces.
3. Help students understand that similar substances work within their stomachs and small intestines to break down the food that they eat. Have students draw or otherwise describe their observations.
4. Mention that turkey meat is a muscle, which is a form of protein—and that protein must be broken into smaller components before it can be used by our bodies. Help students understand that protein is the building block for muscles and that it is used inside each muscle cell. You may want to mention that the chemical meat tenderizer also is a protein—another example of variety of activities that proteins have inside plants and animals.

Meat tenderizer contains an enzyme called papain, which is extracted from the papaya plant. Enzymes break proteins apart into amino acids—smaller molecules that are the building blocks of proteins.

The total surface area of the inside of the small intestine is about 250 m², more or less the same area as a tennis court!

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7. Bio Build-up

Background

Many pollutants in the environment become introduced in very small amounts into organisms near the base of the food chain. These pollutants usually are present in the water or the soil in which producers, such as green plants and algae, or primary consumers, such as filter feeders in aquatic ecosystems, live and reproduce. Pesticides that are applied directly to plants also can be introduced into the food chain.

Some chemical substances, such as pesticides and heavy metals (like mercury and lead), persist within the bodies of the organisms that take them in with food. These compounds are not broken down by the body, nor are they eliminated with other waste products. While most of these substances are not harmful in trace amounts, they can accumulate in the tissues of an organism over its lifetime. In addition, consumers near the top of the food chain tend to accumulate larger amounts of toxic substances in their bodies, because the pollutants become more concentrated at each step of the food chain. The actual amounts of toxins accumulated in the bodies of top consumers depend on their food sources and choices.

Links

This activity may be taught along with the following components of the Food and My World unit.

Adventures:
The Mysterious Marching Vegetables, "The Trap"

Set-up

Have students work in groups of 2–4 to share materials.

Procedure

1. Let the Materials Managers collect a sheet of stickers OR glue and a cup or container with about one cup of unpopped popcorn kernels or dried beans. Each student should complete his or her own "Bio Build-up" sheet.
2. Ask students to think about what might happen to pollutants that are taken up by producers. *Would the pollutants be passed on to whoever ate them? How about the next animal in the food chain? Would they have the pollutants too?* Tell the students that they will have an opportunity to find out what might happen to pollutants in a food chain.
3. Have students work through the steps depicted on the "Bio Build-up!" sheet, which depicts an aquatic ecosystem. The stickers or other markers will represent amounts of toxins that are consumed along each step of the food chain.
4. Once students have completed the activity, ask, *What happened to the pollutants at the last step of the food chain? Did the large*

CONCEPTS

- Pollutants often are taken up by organisms near the base of a food chain.
- Toxic chemicals can become concentrated in the bodies of consumers, especially consumers near the top of the food chain.

OVERVIEW

Students will make a model of a simple food chain and observe how toxins can accumulate in consumers at the top.

SCIENCE, HEALTH & MATH SKILLS

- Counting
- Multiplying
- Observing patterns
- Drawing conclusions

TIME

5 minutes for set-up; 30 minutes to conduct activity

MATERIALS

Each student will need:
- copy of Bio Build-up! student page

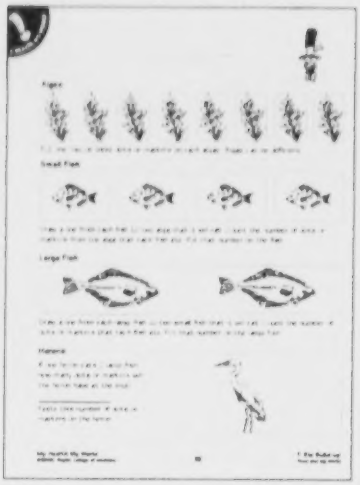
Each group will need:
- small colored adhesive dots (stickers) or cup of dried beans or unpopped popcorn

fish have more or less pollutant than the algae at the beginning of the food chain? Did the amounts of pollutants in the algae at the beginning make a difference in the small and large fish? How could the amount of pollutants in the body of the heron be reduced?

Questions for Students to Think About

- The pesticide, DDT, is another chemical that has been shown to become concentrated in tissues near the top of the food chain. This has been related to reductions in the sizes of populations of several large predatory birds, among other things. What can you find out about DDT use in the United States and the actions that have been taken to make sure that it does not become concentrated in food sources for people and animals?

- Many toxic chemicals are stored in fatty tissues in the bodies of animals. Fat is created to store extra energy when more food is taken in than is used. See what you can find out about the role of fat in the body by checking the library or the Internet.



Mercury in the Food Chain

Mercury, a toxic metal, also is the only metal that is liquid at room temperature. It is used in the manufacturing of thermometers, barometers, fluorescent lights, electrical switches and batteries, for example. When mercury is present in lakes, it becomes transformed by bacteria into a compound that can be dissolved in water. In this form, it can enter the food chain, ending up in fish, which, in turn, can be eaten by people. Mercury can damage the nervous system

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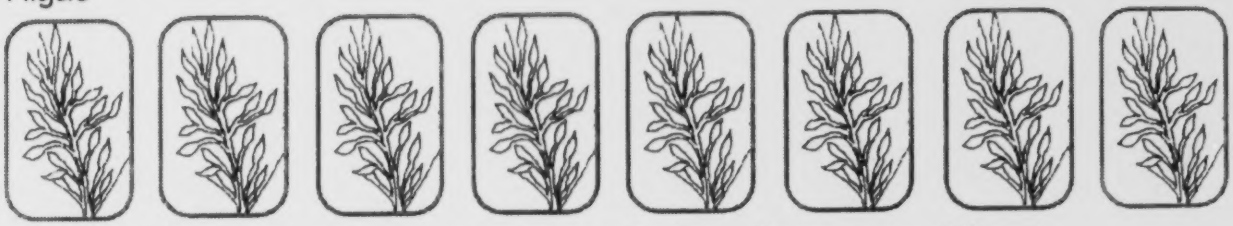
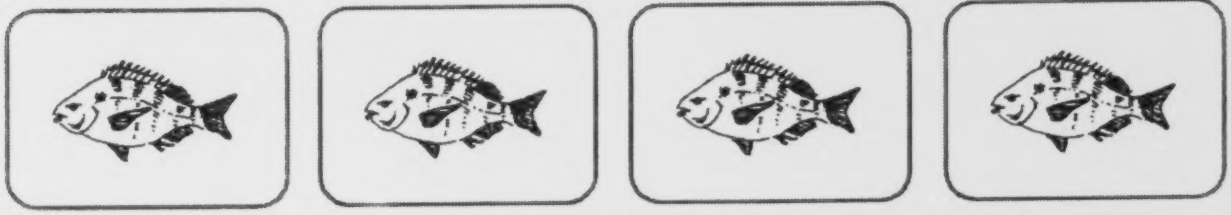
Bio Build-up!

Algae



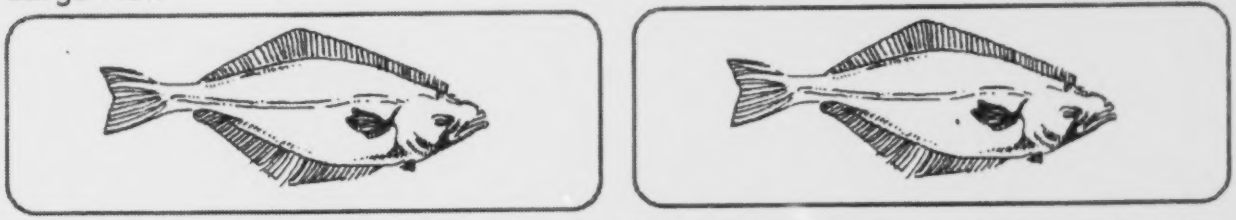
Put one, two or three dots or markers on each algae. Algae can be different.

Small Fish



Draw a line from each fish to two alga that it will eat. Count the number of dots or markers from the alga that each fish ate. Put that number on the fish.

Large Fish



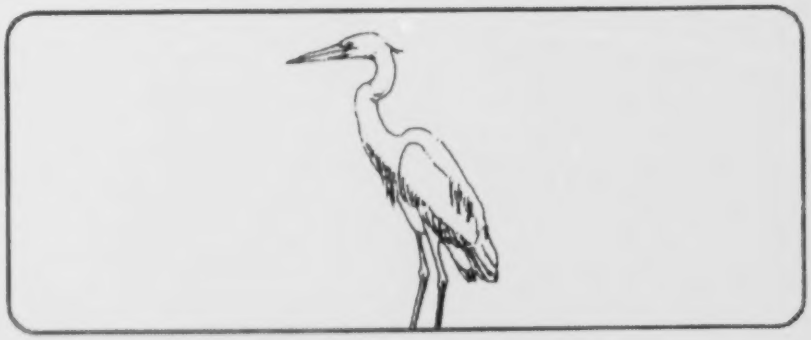
Draw a line from each large fish to two small fish that it will eat. Count the number of dots or markers that each fish ate. Put that number on the large fish.

Herons

If one heron eats 2 large fish, how many dots or markers will the heron have at the end?

_____.

Paste this number of dots or markers on the heron.



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8. They're Everywhere!

Background

Bacteria are the most numerous of all living things on our planet. However, bacteria are so tiny that it is not possible to see one without the aid of a microscope. Most bacteria need to be magnified about 400 times before they can be observed. Each bacterium (a single bacteria) consists of one cell which is capable of reproducing very rapidly. In fact, one bacterium cell can give rise to millions of others in just one day.

Bacteria are essential for many processes that affect other organisms. Bacteria are important decomposers in almost all ecosystems. Photosynthetic bacteria (also known as blue-green algae) are vital producers in aquatic ecosystems. Bacteria in the intestine help break down some large food molecules during digestion.

Bacteria also can cause serious problems with food. Since bacteria are everywhere, it is easy for food to become contaminated by bacteria and begin to spoil. The slime you see on food that has sat in the refrigerator too long consists of colonies of bacteria and, sometimes, fungi, as well. Spoiled food can cause disease in humans and other animals.

Bacteria can be transferred to food when people do not wash their hands after using the bathroom, changing a diaper or playing with pets. Some foods, especially meats, can have bacteria on their outside surfaces. These bacteria can be transferred to other foods if knives, spoons and cutting boards are not washed with soap and water.

This activity allows students to observe bacteria and to compare relative amounts of bacteria in different parts of the home, classroom or school.

Links

This activity may be taught along with the following components of the Food and My World unit.

Adventures:
The Mysterious Marching Vegetables, "Friends for Dinner"

Set-up

Most bacteria are harmless to healthy people. However, since some kinds of bacteria cause disease, it is important that students do not open the resealable plastic bags in which they are growing their cultures.

Students will use boiled slices of potato on which to grow bacteria. The slices and the utensils that you use to handle them should be sterile. Boiling kills most bacteria and fungi and will be sufficient for this activity. To prepare the slices, cut one or more potatoes into 1/4 inch slices. Leave the skin on to help hold the

CONCEPTS

- Bacteria are everywhere.
- Bacteria need food to grow.
- Bacteria are important decomposers, but they also can cause many different kinds of diseases.
- Bacteria are a major source of food contamination.

OVERVIEW

Students will grow bacteria on potato slices from a variety of locations and compare the results.

SCIENCE, HEALTH & MATH SKILLS

- Designing an experiment
- Making observations
- Drawing conclusions

TIME

Session one: 30 minutes for set-up, 30 minutes to conduct activity;
Session two: 30 minutes

MATERIALS

Each group will need:

- boiled potato slices (see Set-up)
- 2 or more resealable plastic bags
- 2 or more cotton swabs

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slices together. Boil the slices in tap water on a hotplate or in the microwave for 10 minutes. After boiling, cover the container and leave the slices in the water until you are ready to use them.

Students should work in teams of four to plan and carry out their experiments.

Procedure

Session One: Setting up

1. Tell students that they will be learning about bacteria—tiny microorganisms present everywhere that are responsible for causing things to decompose. Ask students to mention what they know or have heard about bacteria. List their ideas on the board.
2. Point out that bacteria are a major source of contamination of food and that students will be investigating where bacteria might be present. Ask, *Can we see where bacteria are? How might we be able to find out where there are the most bacteria in the room* (school, etc.)*?*
3. Tell students that one way to study bacteria is to let them grow until they form a clump that is large enough to see. Mention that they will be growing bacteria on potato slices.
4. Have each group of students select two or more places that they would like to test for the presence of bacteria. Possibilities include the floor, doorknob, unwashed hands, rinsed hands, hands washed with soap and water, bottom of shoes, etc. Give each group a resealable plastic bag for each test that they will be conducting.
5. Have the groups label the bags with their group name or number and the item or location being tested.
6. With boiled tongs, place one slice of potato inside each bag that has been prepared by students. Point out that they should not touch the slice or leave the bags open, or the slices will become contaminated with bacteria from their hands or in the air.
7. Using clean cotton swabs, have students sample the areas they have chosen. For each sample, a student should rub the swab several times over the area to be tested. Then, they should open a bag with a potato slice and rub the same swab several times over the slice. The bags should be sealed tightly and taped closed. Put the bags in a place out of direct light where they will not be disturbed.
8. Have students predict which of their cultures will grow the most bacteria, and which the least.

Session Two: Observations

1. If possible, have students observe the cultures every day for 1–3 days. After about three days, have them make detailed observations. Ask, *Did anything grow on the potato slices?* Bacteria will discolor the slices and form smooth, wrinkly or

Several common illnesses can be caused by bacteria in food. Sometimes the bacteria themselves cause illness. Toxins produced by bacteria also can be harmful and cause sickness. Signs of food poisoning can include severe vomiting, diarrhea, abdominal cramping and fever. Common organisms that infect food include the following:

- **Salmonella bacteria**—*infection usually can be avoided by cleaning hands and utensils well before cooking and eating, by cooking meat and poultry thoroughly and by cleaning knives and cutting boards thoroughly with hot, soapy water.*
- **Staphylococcus bacteria**—*infection usually can be avoided by keeping foods, especially meats, well refrigerated and by keeping hands and cooking utensils clean.*
- **Clostridium bacteria**—*a dangerous form of illness called food poisoning, caused by the Clostridium bacteria. These bacteria can grow in canned goods that have not been properly sterilized or that have been damaged in transport.*

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slimy blotches of different colors on the slices. Fungi, which form fuzzy colonies, also may be present.

2. Have students decide how many different kinds of organisms might be growing on the slices, based on differences that they can observe. Do not allow students to open the bags.
3. Next, have students decide whether some sample sources had more bacteria than others. Have them record their observations and conclusions. Have the groups share their results with the rest of the class.
4. Based on the results, have students decide which locations in the room (or school) have the most bacteria, and which the least. Ask, *If there are bacteria all around us, why aren't all of us sick? Do all bacteria make us sick? How about the potato slices—would you want to eat these? Do you think that it is good to have bacteria growing in our food?*
5. Help students understand that contamination of food by bacteria can cause serious health problems. Ask for suggestions on how to keep food clean. Possibilities include: using clean hands and utensils for food preparation, keeping food covered and refrigerated until used, and cooking food thoroughly to kill bacteria that might be present.

Variations

• Design additional experiments that use the potato slices to test for the presence of bacteria. You might test water from different sources or see which different kinds of food grow the most kinds of bacteria or become spoiled quickly by bacteria.

Questions for Students to Think About

• Bacteria are everywhere. They can be found on nearly every surface—including skin. They also are found inside the digestive tract, in the mouth, throat and intestines. However, they are not found anywhere inside the tissues of the body or in the blood in healthy persons. Bacteria inside the body can cause serious diseases if the body's immune system is not able to fight them off. Bacteria also are helpful. How many good uses of bacteria can you find? Look for information about bacteria in the library or on the Internet.

Keep bacteria from growing on food by:

• Washing hands with soap and water after using the restroom, and before preparing or eating food

• Rinsing fruits and vegetables under running water before cooking and eating.

• Cooking meats, fish, and poultry until well done. Washing raw poultry, beef, pork, lamb or veal before cooking is not recommended by the US Department of Agriculture. Any bacteria present on the surface is killed during cooking.

• Washing cooking surfaces and utensils with warm water and soap. Use plastic or non-porous cutting boards and wash them in the dishwasher.

• Not using the same knives and utensils for different kinds of meats, chicken or other cooked foods. Bacteria can be transferred from one food to another.

• Refrigerating fresh foods and cooked foods promptly.

• Never placing cooked foods on a plate which previously held raw meat, poultry or seafood.

• Cooking eggs until the yolk and white are firm, not runny. Don't use recipes that call for raw or partially cooked eggs.

• Packing lunches for school or work in portable coolers.

9. Using Food Labels

Background

Beginning in 1994, the US Government began requiring that manufacturers put information about nutritional value on food labels. The information on food labels can be used to help make better choices about which foods to buy and eat.

All food labels must present the same basic information in a standard format. This information includes, as a minimum, the amount per serving of saturated fat, cholesterol, dietary fiber,and other nutrients known to be important for health. Labels also provide nutrient reference values, expressed as % Daily Values, to help consumers see how a food fits into an overall daily diet. It is important to pay attention to the servings sizes as defined on the food label.

In addition, packages must list all ingredients in foods. This list is given in order, by weight, beginning with the ingredient that weighs the most. This information can be helpful when selecting and evaluating foods.

CARBOHYDRATES are the body's main source of fuel. Starchy foods like breads, spaghetti, rice, potatoes, corn and cereals are made up mostly of carbohydrates. Sugary foods like candy, jam and syrups also are carbohydrates. Some carbohydrates, called fiber or roughage, are hard to digest. They help move waste through the digestive system.

FATS include butter, margarine, lard, shortening and cooking oils. Meats, cheese, cream, chocolate and many desserts like cakes and cookies usually have a lot of fat. Fats are very concentrated sources of energy. Saturated fats and cholesterol have been linked to diseases of the heart and circulatory system. Most Americans eat too many saturated fats every day.

PROTEINS are important for growth and repair of the body. Protein-rich foods include eggs, milk products, meat, dried beans, chicken, turkey and fish. The body also can use protein as fuel to provide energy for movement and growth.

MINERALS are found in small amounts in foods. They are needed for many of the body's functions. For example, calcium is used to build bones and teeth, and also is important for muscles and the nervous system. Iron goes into making red blood cells.

VITAMINS are other chemicals found naturally in food that are needed in very small amounts by the body. Fruits and vegetables, which frequently are left out of the American diet, are valuable sources of vitamins and minerals.

Surprisingly, all foods also contain some amount of water.

Links

This activity may be taught along with the following components of the Food and My World unit.

CONCEPTS

- Food labels provide important information about the nutritional value of foods.
-

OVERVIEW

Students will learn about food labels to prompt their thinking about healthful eating They also will explore units commonly used on food labels.

SCIENCE, HEALTH & MATH SKILLS

- Measuring
- Comparing measurements
- Making observations
- Drawing conclusions

TIME

10 minutes for set-up; 30 minutes to conduct activity

MATERIALS

Each student will need:

- copy of From the Label to the Table! and Sugar Measures Up pages

Each team of students will need:

- approximately 1 cup of white sugar
- measuring cup
- teaspoon

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Adventures:

The Mysterious Marching Vegetables, "Preparing a Picnic," "Food for All"

Set-up

Have students work in groups of 2–4. Set up sugar and other materials in a central location.

Procedure

1. Remind students of the food pyramid they used at the beginning of the unit and which has appeared in the story, *The Mysterious Marching Vegetables*. Ask, *How can we be sure that the foods we eat contain the nutrients that we need each day?*.
2. Mention that packaged foods now have uniform labels that provide us with information about the nutritional value of foods. Distribute copies of the "From the Label to the Table!" page.
3. Have students read the labels depicted on the student page out loud in their groups. Have them draw lines to connect the boxes on the page to related parts of the food label. Follow by helping them understand the following concepts on the label.

   Serving Size: amount that the nutrition facts are based on. If someone eats more than the serving size, they will receive more of the calories and nutrients than the amounts listed on the label.

   Calories: measure of the amount of energy a food can provide. Most people need somewhere around 2,000 to 2,500 calories a day to meet their energy needs.

   Calories from Fat: percentage of the calories that come fats and oils in the food. Foods that are labeled "light" must have one half the fat of similar foods to which they are compared.

   Total Fat: weight of all the fat in one serving. Most people should have less than 65 g of fat each day.

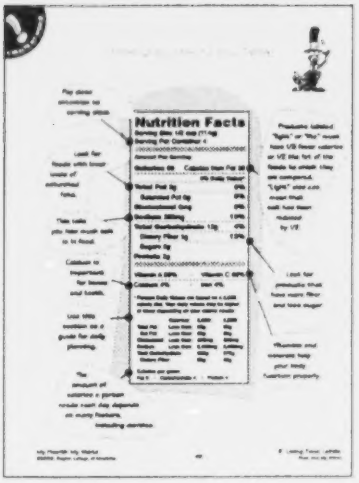
   Saturated Fat: weight of animal and similar fats that contribute to heart disease and other health problems. Most people should have less than 20 g of saturated fat each day.

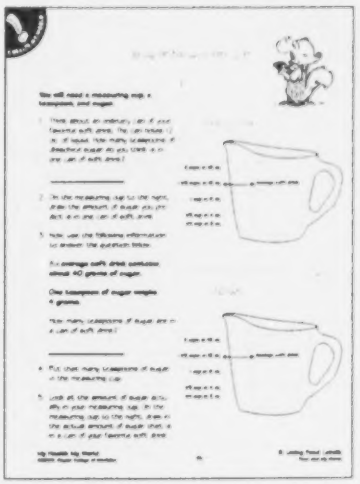
   Sodium: amount of salt in a food. Some people need to restrict the amount of salt in their diet.

   Total carbohydrate: sugars, starches and different kinds of fiber. Sugars are good energy sources, but most people eat too much sugar. Brown sugar, molasses, honey and corn syrup all are kinds of sugars. Dietary fiber is important to health.

   Protein: essential for building muscles and for many body functions.

   Vitamins and Minerals: materials in food that are essential for health. It is important to meet 100% of the daily requirement of vitamins and minerals by including 5–9 servings of fruits and vegetables into each days' diet.





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4. Ask students, *What are the units of measure mentioned on the Nutrition Facts label?* (cups and grams) Mention that they will be investigating these measures using sugar as an example.
5. Have students, in their groups, follow the instructions on the "Sugar Measures Up" page. They will explore how much sugar is contained in a typical soft drink.
6. Afterwards, ask, *Were you surprised about the amount of sugar in one soft drink? How many soft drinks would you need to meet your daily total carbohydrate requirement? Do you think that that would be a good way to fuel your body?*

Variations

• Have students investigate weights of other ingredients on the food label. Try using margarine pats for oils or bran cereal for fiber.

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From the Label to the Table!

Pay close attention to serving sizes.

Look for foods with lower levels of saturated fats.

This tells you how much salt is in food.

Calcium is important for bones and teeth.

Use this section as a guide for daily planning.

The amount of calories a person needs each day depends on many factors, including exercise.

Nutrition Facts

Serving Size 1/2 cup (114g)
Serving Per Container 4

Amount Per Serving

Calories 90	Calories from Fat 30
	0% Daily Value*
Total Fat 3g	**5%**
Saturated Fat 0g	**0%**
Cholesterol 0mg	**0%**
Sodium 300mg	**13%**
Total Carbohydrate 13g	**4%**
Dietary Fiber 3g	**12%**
Sugars 3g	
Protein 3g	
Vitamin A 80% •	Vitamin C 60%
Calcium 4% •	Iron 4%

* Percent Daily Values are based on a 2,000 calorie diet. Your daily values may be higher or lower depending on your calorie needs:

	Calories:	2,000:	2,500:
Total Fat	Less than	65g	80g
Sat Fat	Less than	20g	25g
Cholesterol	Less than	300mg	300mg
Sodium	Less than	2,400mg	2,400mg
Total Carbohydrate		300g	375g
Dietary Fiber		25g	30g

Calories per gram:
Fat 9 • Carbohydrate 4 • Protein 4

Products labeled "light" or "lite" must have 1/3 fewer calories or 1/2 the fat of the foods to which they are compared. "Light" also can mean that salt has been reduced by 1/2.

Look for products that have more fiber and less sugar.

Vitamins and minerals help your body function properly.

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Sugar Measures Up

You will need a measuring cup, a teaspoon, and sugar.

1. Think about an ordinary can of your favorite soft drink. The can holds 12 oz. of liquid. How many teaspoons of dissolved sugar do you think is in one can of soft drink?

   _____

2. On the measuring cup to the right, draw the amount of sugar you predict is in one can of soft drink.

3. Now, use the following information to answer the question below.

   An average soft drink contains about 40 grams of sugar.

   One teaspoon of sugar weighs 4 grams.

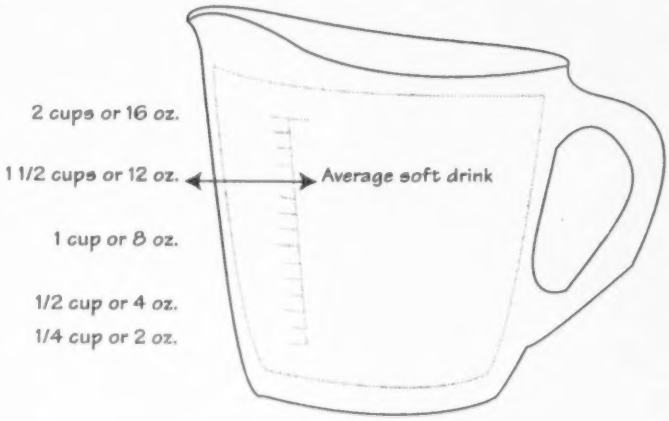
   How many teaspoons of sugar are in a can of soft drink?

   _____

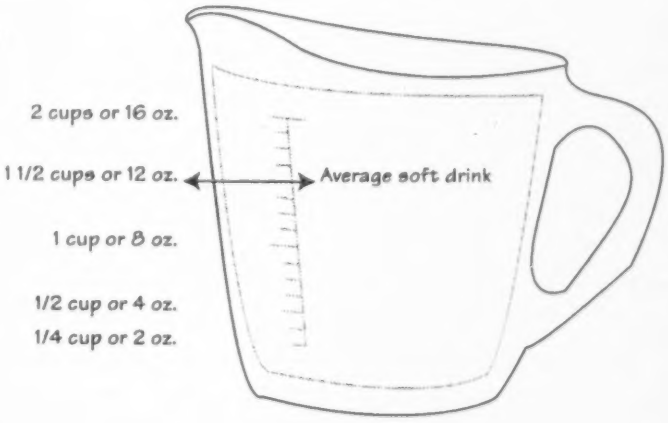
4. Put that many teaspoons of sugar in the measuring cup.

5. Look at the amount of sugar actually in your measuring cup. On the measuring cup to the right, draw in the actual amount of sugar that is in a can of your favorite soft drink.

PREDICTION



ACTUAL



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10. Let's Eat

Background

Simple techniques during food preparation help maintain foods free of bacteria and also help reduce the consumption of chemicals applied to fruits and vegetables. Some important food preparation tips include:

- Always wash fruits, vegetables, meats, fish and poultry carefully.
- Always wash hands before beginning any food preparation.
- Always wash utensils for cooking and eating, such as knives and cutting boards, in hot, soapy water. Clean cutting boards and work surfaces with a 1:10 bleach and cold water solution to kill bacteria.
- Always clean cutting boards between cutting of different food items.
- Cook all meats, fish, eggs and poultry thoroughly.
- Use ground meats within 24 hours (or freeze) and cook thoroughly.
- In home gardens, use pesticides as little as possible.
- Avoid eating fish and seafood from polluted water.

This activity will allow students to observe good food preparation practices while making a fun treat—ice cream!

Links

This activity may be taught along with the following components of the Food and My World unit.

Adventures:

The Mysterious Marching Vegetables, "Preparing a Picnic," "Food for All"

Set-up

Have students work in pairs to share materials. Each student, however, should prepare his or her own batch of ice cream. Arrange the materials that students will need to measure along a counter, "cafeteria style." Students should practice safe food preparation procedures by using clean utensils, washing work surfaces, and washing hands before beginning. New sandwich bags do not need to be washed before use.

Procedure

1. Before beginning, have students talk about ways that they could keep food clean during preparation. List their ideas on the board. Mention additional points listed above as necessary to complete the discussion.
2. Tell students that they will be making one of their favorite

CONCEPTS

- There are simple things that can be done during food preparation to reduce contamination of food.
- Snacks can be nutritious and fun!

OVERVIEW

Students will learn about safe food preparation by making fruit ice cream in class.

SCIENCE, HEALTH & MATH SKILLS

- Measuring
- Planning a step-wise procedure
- Making observations

TIME

30 minutes for set-up; 30 minutes to conduct activity

MATERIALS

Each team of 2 students will need:

- 2 freezer-weight resealable sandwich-size plastic bags
- gallon-size freezer-weight resealable plastic bag
- 1 gallon of orange juice (or 1/2 cup per student)
- measuring cup
- 2 tablespoons sugar
- 1/2 cup plain milk
- 1 teaspoon plain gelatin
- 6 tablespoons rock salt
- 1 plastic spoon per student
- copy of Good and Healthy! sheet

You will also need simple clean-up supplies: clean sponge or rag, soapy water, hand soap, etc. for students to use.

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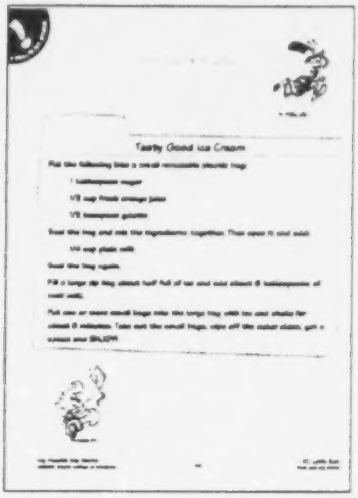
foods—ice cream. Go over the steps that they will follow to make the ice cream, as listed on the "Good and Healthy!" sheet. Have students identify the different steps that will require care to keep their food clean.

3. Before beginning, have the students wash their hands and work areas.
4. Have each student measure the following ingredients into a freezer-weight resealable plastic bag: 1/2 cup of orange juice, 1/2 teaspoon gelatin, 2 tablespoons sugar. Have them seal the bags and mix these ingredients together. Then have each student add 1/4 cup plain, unflavored milk to the bag.
5. Have each team of two students fill a gallon-size resealable plastic bag about half full of ice and add about 6 tablespoons of rock salt.
6. Direct both members of each team to place their bags inside the gallon bag with ice and seal the large bag carefully. Have them take turns shaking the bags until the mixture freezes.
7. Let students remove the smaller bags, wipe off the salt water and enjoy their sweet treat.



Variations

• Let students bring raisins, chocolate chips, sprinkles, etc., from home to add to their ice cream. Or have them bring different kinds of fruit to use. A half cup of mashed bananas, strawberries or another kind of juice can be substituted for the orange juice.

Questions for Students to Think About

• When making the ice cream, did a physical or a chemical change take place? How do we know?

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Good and Healthy!

Tasty Good Ice Cream

Put the following into a small resealable plastic bag:

1 tablespoon sugar

1/2 cup fresh orange juice

1/2 teaspoon gelatin

Seal the bag and mix the ingredients together. Then open it and add:

1/4 cup plain milk

Seal the bag again.

Fill a large zip bag about half full of ice and add about 6 tablespoons of rock salt.

Put one or more small bags into the large bag with ice and shake for about 5 minutes. Take out the small bags, wipe off the outer sides, get a spoon and ENJOY!

11. Healthy Snacks

Background

This activity is designed to assess student learning of concepts presented in the unit. Some of these include:

- photosynthesis as the source of energy at the base of the food chain;
- food webs and interrelatedness of components in ecosystems;
- where food comes from;
- choosing a healthy diet;
- persistence of certain contaminants (especially heavy metals and compounds such as pesticides) in the food chain;
- contamination of food especially by bacteria and other microorganisms; and
- appropriate food-handling techniques to reduce likelihood of contracting food-borne parasites or bacterial infections, and to reduce contamination of food by pesticides and other chemicals.

Links

This activity may be taught along with the following components of the Food and My World unit.

The Mysterious Marching Vegetables, Review Science Boxes throughout

Set-up

Have students work in groups of 2–4.

Procedure

1. Distribute a copy of the "What's Really In There?" page to each group of students. Explain that they will applying their new knowledge about choosing healthy foods and food preparation.
2. Within their groups, have students discuss the contents of the foods described in each of the labels. They should notice how much fats, carbohydrates, sugars, etc. are in each item.
3. After their discussion, have each group rank the snacks, in order, from most healthy to least healthy. On a separate sheet of paper students should write a short paragraph about the evidence they used to create their rankings. Each group should identify which food groups are represented in each snack, and whether the quantities are present in healthy amounts.

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CONCEPTS

- Culminating activity designed to assess student learning of concepts presented throughout unit, especially their knowledge of personal nutrition.

OVERVIEW

Students will rank food labels from most to least healthful, and justify their rankings. Students also will suggest ways to keep their snacks from spoiling.

SCIENCE, HEALTH & MATH SKILLS

- Making observations
- Recording observations
- Drawing conclusions

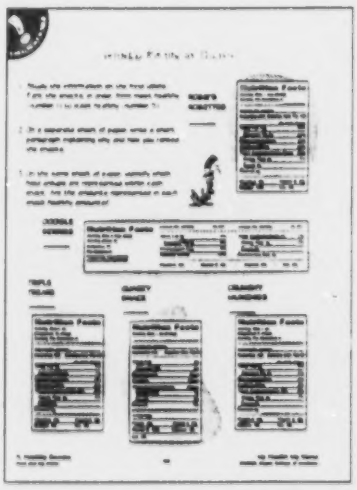
TIME

Session one: 5 minutes for set-up, 30 minutes to conduct activity;
Session two: 30 minutes

MATERIALS

Each group will need:

- copy of What's Really In There? student page



What's Really In There?

1. Study the information on the food labels. Rank the snacks, in order, from most healthy (number 1) to least healthy (number 5).

2. On a separate sheet of paper, write a short paragraph explaining why and how you ranked the snacks.

3. On the same sheet of paper, identify which food groups are represented within each snack. Are the amounts represented in each snack healthy amounts?

ROSIE'S ROSETTES

_____

Nutrition Facts
Serving Size 1 cup (228g)
Serving Per Container 2

Amount Per Serving	
Calories 260	Calories from Fat 120
	0% Daily Value*
Total Fat 13g	**20%**
Saturated Fat 5g	**25%**
Cholesterol 30mg	**10%**
Sodium 660mg	**28%**
Total Carbohydrate 31mg	**10%**
Dietary Fiber 0g	**0%**
Sugars 5g	
Protein 5g	

Vitamin A 4% • Vitamin C 2%
Calcium 15% • Iron 4%

GOOGLE BERRIES

_____

Nutrition Facts
Serving Size 2 tbsp (33g)
Serving about 10
Calories 15
Fat Calories 0
Percent Daily Values (DV) are based on a 2,000 calorie diet.

Amount Per Serving	0% DV*	Amount Per Serving	0% DV*
Total Fat 0g	**0%**	**Total Carbohydrate** 3g	**1%**
Saturated Fat 0g	**0%**	Dietary Fiber 1g	**4%**
Cholesterol 0mg	**0%**	Sugars 0g	
Sodium 230mg	**10%**	**Protein** less than 1g	

Vitamin A 8% • Vitamin C 6% • Calcium 0% • Iron 0%

TRIPLE TREATS

_____

Nutrition Facts
Serving Size 1 oz
(28g/about 13 chips)
Serving Per Container 8

Amount Per Serving	
Calories 120	Calories from Fat 10
	0% Daily Value*
Total Fat 1g	**2%**
Saturated Fat 1g	**1%**
Cholesterol 0mg	**0%**
Sodium 140mg	**6%**
Total Carbohydrate 24g	**8%**
Dietary Fiber 2g	**8%**
Sugars 0g	
Protein 3g	

Vitamin A 0% • Vitamin C 0%
Calcium 4% • Iron 0%

QUACKY SNACK

_____

Nutrition Facts
Serving Size 1 jar (140g)

Amount Per Serving	
Calories 110	Calories from Fat 0
Total Fat	**0g**
Saturated Fat	**0g**
Cholesterol	**0mg**
Sodium	**10mg**
Total Carbohydrate	**27mg**
Dietary Fiber	**4g**
Sugars	**0g**
Protein	**0g**

% Daily Value

Protein 0% • Vitamin A 6%
Vitamin C 45% • Calcium 2%
Iron 2%

CRUNCHY MUNCHIES

_____

Nutrition Facts
Serving Size 1 oz
(28g/about 6 chips)
Serving Per Container 9

Amount Per Serving	
Calories 130	Calories from Fat 50
	0% Daily Value*
Total Fat 6g	**9%**
Saturated Fat 1g	**5%**
Cholesterol 0mg	**0%**
Sodium 80mg	**3%**
Total Carbohydrate 19g	**6%**
Dietary Fiber 1g	**4%**
Sugars 0g	
Protein 2g	

Vitamin A 0% • Vitamin C 0%
Calcium 4% • Iron 0%

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MY HEALTH MY WORLD
FOOD AND MY WORLD

EXPLORATIONS

FOR CHILDREN AND ADULTS

Read the phrases to the right describing the six food groups.

Match each phrase to one of the daily food requirements shown in the sections of the pyramid.

Match the foods shown to the proper sections of the pyramid.

Remember, some foods fit in more than one section!

BREADS, GRAINS, TORTILLAS & PASTA
MILK PRODUCTS
FRUITS
VEGETABLES
FATS & SWEETS
MEAT, FISH, NUTS & BEANS

Eat just a bit of these

Have 2 – 3 servings

Select 2 – 3 servings

Choose 3 – 5 servings each day from these

Pick 2 – 4 servings from this group

Make 6 – 11 selections from this group every day!

How much is a serving?

One slice of bread, one medium apple, one egg or one cup of milk counts as a serving. Do you know which group each serving belongs to?

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See page 4 for Food Pyramid answers.

Let's Talk about... The

Fuel for Minds and Bodies. When you had breakfast, you probably weren't thinking about powering your brain and your body, but that's exactly what your meal was doing. Food gives your body the fuel and raw materials it needs every day, especially in the morning.

Calories are units used to measure energy in food. A calorie is defined as the amount of heat necessary to warm a kilogram of water (about one liter) by one degree Celsius.

Just like a car needs gasoline, you need energy to move, think and grow. The usable energy you get from food is measured in calories. The more calories a food has, the more energy it can supply. The amount of calories a person needs each day depends on his or her size and level of activity. The body stores extra calories as fat, which can be used later. It is important to have some body fat, but too much fat is unhealthy.

Of course, food provides more than just energy. It supplies building materials, such as proteins and minerals, for muscles, bones and other body parts. Food also has vitamins that help make energy available for muscles and the brain, and make other body functions possible.

Sun Power. One way or another, all food on Earth comes from green plants and other living things that capture energy from the sun. They do this through a process called **photosynthesis**. The word photosynthesis means to make something new "synthesis" from light "photo." Plants make all their own food from sunlight, water, air and nutrients in soil. Organisms that make their own food from light energy are called **producers**.

Animals are called **consumers**, because they are not able to make their own food. Instead, they get the energy and other materials they need by eating plants or other animals.

Some organisms, like various members of the fungus kingdom (mushrooms and their relatives), get all of their food from pieces of dead plants and animals in soil. These organisms are known as **decomposers**. Many **microbes**, tiny organisms too small to see without a microscope, also live off rotting things.

Food We Eat

Microbes, such as bacteria, are found everywhere. Some microbes are helpful, but others can make people sick. Sometimes harmful microbes even can be found on or growing inside food.

Food that is Safe to Eat. Most of the food you eat is grown on farms far away from your community. It is transported over long distances to reach your grocery store. Most of the food in stores is either packed in boxes, cans and jars, or kept cold or frozen to keep it from spoiling. Food spoils when too many bacteria and other microbes are growing on it. Eventually, this food will rot and smell bad. Sometimes, however, even food that looks and smells okay may not be safe to eat.

Cooking food kills bacteria and other microbes that can make you sick. It also makes food easier to digest.

Many food packages are printed with words like "use by," followed by a date. This information is provided to help you know whether foods are still good to eat. Foods that are old may have too many bacteria or other microbes.

It's important to wash your hands after using the bathroom or before preparing food. Microbes on your hands could end up in your meal! They also can end up on knives, spoons, cutting boards and other things you use to prepare food.

Sometimes you hear about people getting "food poisoning." This means that they got sick from microbes in food. Keep yourself safe by following the "Tips for Health Living."

Look for more food safety tips on the Internet at:

www.5aday.gov
www.eatright.org
www.foodsafety.gov
www.fda.gov

Tips for Healthy Living

- Eat a variety of foods, including plenty of vegetables, fruits, and grain products, such as pasta, cereals, tortillas and breads.
- Don't eat too many sugary foods.
- Eat less of foods that have a lot of butter, lard, oil or other fats.
- Wash hands with soap and warm water before preparing food and after using the bathroom, changing diapers or handling pets.
- Rinse fruits and vegetables under running tap water before eating or cooking them.
- Wash knives, cutting boards, utensils and cooking areas with soap and hot water.
- Avoid using the same knives and cutting boards for different raw foods, especially meats, fish and poultry.
- Cook eggs, chicken, turkey, meats and fish until they are well done.
- Refrigerate fresh foods and leftovers promptly.

From the Label to the Table!

Beginning in 1994, the US government began requiring manufacturers to put information about nutritional value on food labels. You can use this information to make better choices about what you eat.

What is in food?

Food provides your body with all of the materials it needs to grow, and to be healthy and active. These are some of the building blocks in food.

CARBOHYDRATES are the body's main source of fuel. Starchy foods like breads, spaghetti, rice, potatoes, corn and cereals are made up mostly of carbohydrates. Sugary foods like candy, jam and syrups also are carbohydrates. Some carbohydrates, called fiber or roughage, are hard to digest. They help move waste through the digestive system.

FATS include butter, margarine, lard, shortening and cooking oil. Cheese, cream, chocolate, some meats and many desserts have a lot of fat. Fats are very concentrated sources of energy, so only a little is needed.

PROTEINS are important for growth and repair of the body. Protein-rich foods include eggs, milk products, meat, dried beans, chicken, turkey and fish. The body also can use protein as fuel for movement and growth.

MINERALS are found in small amounts in foods. They are needed for many of the body's functions. For example, calcium is used to build bones and teeth, and also is important for muscles and the nervous system. Iron becomes part of red blood cells.

VITAMINS are other chemicals found naturally in food. They are needed in very small amounts by the body.

Did you know that **WATER** also is a major part of almost all food?

Pay close attention to serving sizes.

Look for foods with lower levels of saturated fats.

This tells you how much salt is in food.

Calcium is important for bones and teeth.

Use this section as a guide for daily planning.

The amount of calories a person needs each day depends on many factors, including exercise.

Nutrition Facts

Serving Size 1/2 cup (114g)
Serving Per Container 4

Amount Per Serving	
Calories 90	Calories from Fat 30
	0% Daily Value*
Total Fat 3g	**5%**
Saturated Fat 0g	**0%**
Cholesterol 0mg	**0%**
Sodium 300mg	**13%**
Total Carbohydrate 13g	**4%**
Dietary Fiber 3g	**12%**
Sugars 3g	
Protein 3g	

Vitamin A 80%	Vitamin C 60%
Calcium 4%	Iron 4%

* Percent Daily Values are based on a 2,000 calorie diet. Your daily values may be higher or lower depending on your calorie needs:

	Calories:	2,000:	2,500:
Total Fat	Less than	65g	80g
Sat Fat	Less than	20g	25g
Cholesterol	Less than	300mg	300mg
Sodium	Less than	2,400mg	2,400mg
Total Carbohydrate		300g	375g
Dietary Fiber		25g	30g

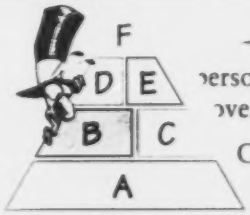
Calories per gram:
Fat 9 • Carbohydrate 4 • Protein 4

Products labeled "light" or "lite" must have 1/3 fewer calories or 1/2 the fat of the foods to which they are compared. "Light" also can mean that salt has been reduced by 1/2.

Look for products that have more fiber and less sugar.

Vitamins and minerals help your body function properly.

Make a food diary for each member of your family. Have places to record the foods eaten and approximate amounts. *This is where estimation skills come in handy!* Ask each person to complete the diary over the course of a day.



A. BREAD GROUP
B. VEGETABLES
C. FRUITS
D. MILK PRODUCTS
E. MEAT GROUP
F. FATS & SWEETS

Compare the finished food diaries with the food pyramid to the left, and on the cover. *Did each person get what they need from every group? How did you do? What recommendations can you make?* Eating a healthy diet doesn't mean giving up your favorite foods! Just balance your food choices and eat smaller amounts of the richer foods at the top of the pyramid.

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we can make a difference!

We are students at MacArthur Elementary School in Galena Park, Texas. We are learning about nutrition and food safety.

We washed our hands before starting.

We included some healthy ingredients.

We measured,

and mixed,

and shaped the cookies.

We had a nutritious snack of healthy cookies and milk.

We put the extra cookies in covered containers in the refrigerato

We cleaned everything with soap and water.

CHOCO-CRUNCH COOKIES

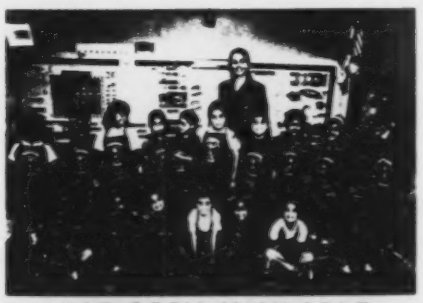
1 cup sunflower seeds
1 cup raisins, chopped
1 cup mini-chocolate chips or large chips, chopped in blender
1/4 cup rice crispies
3/4 cup peanut butter

topping

1/2 cup powdered sugar
or
1 cup coconut

Mix all ingredients together. Form into 1-inch balls by pressing the mixture firmly together with clean hands.

Gently roll in either powdered sugar or coconut. Cover and refrigerate any leftovers.



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Food For You!

Here is a poem about how to fuel your body. Some words have been left out. Read the poem and fill in the missing words as you go. Choose the right word for each space from the words on Mr. Slaptail's "Remember!" list. The last word is *not* on the list. Guess what it is, and you will know everything the right foods do for you!

Mom says eat your veggies.
Dad says eat your fruit.
At least five servings daily
of flowers, stems and roots.

Now add nutritious _____ foods
to make strong teeth and bones.
There's chocolate milk and cheeses,
and even ice cream cones!

Breads and rice and cereals,
tortillas, pastas, too;
essential _____,
the basics just for you.

Beans and seeds build muscles,
so do fish and chicken.
These _____ help you grow up strong,
and keep your body tickin'!

If you'd like some candy,
or other _____ treats,
only have one serving.
Hey, watch how much you eat!

The foods you choose as _____
help take you through the day.
Food gives you all the things you need
to think and work and _____.

How much fat is hidden in your favorite foods? Try this!

1. Cut a grocery bag to make a large flat sheet.
2. Fold the sheet to make at least eight equal squares.
3. In each square, write the name of a food you would like to test for fat content.
4. Predict whether each food has fat by writing FAT or NO FAT on the edge of each square.
5. Find and place similar-sized pieces of food on the squares with their names.
6. The next day, remove the foods and check for fats by holding the sheet up to the light. If any squares are dark and shiny, oil has soaked into the paper and made them translucent.
   The more oil on the brown paper, the more fat in your food. *Were there any surprises?*

Not such a new issue...

People always have looked for ways to keep their food from spoiling while it is stored. One way is to remove most of the water from food by allowing it to dry, or dehydrate. The ancient Egyptians, native American groups and even early American settlers dried foods to keep them for longer periods of time. Dehydration makes it harder for microbes to grow on food and cause it to spoil. It also makes food lighter and easier to store and transport. Today, we still dry foods to preserve them. For example, most foods for astronauts are dehydrated. *Can you think of more examples?*

Rosie and Riff talk to...

Marta L. Fiorotto, Ph.D.

Growth Biologist

What do you do at your job?

I study the influence of diet on growth in babies. Also, I'm working to learn more about how to promote muscle growth in children. One of the most interesting parts of my job has been to develop a machine that compares levels of muscle and body fat in babies who are breast fed with those levels in babies who are fed baby formula.

How did you decide to do this kind of work?

I grew up in a remote part of Tanzania, in Africa. My family lived on a farm, where we grew coffee and corn, so much of our lives revolved around the table and food. Also, I noticed that other children I met often seemed small and unhealthy. I began to understand that many of these children did not get enough milk and were malnourished. Ever since, I have been interested in nutrition and its role in maintaining good health.

Have you always been interested in science?

Yes. From the time I was young, my father showed me how things worked. Without knowing it, he taught me many fundamental science concepts, which made me inquisitive at a very early age. In fact, sometimes I think my whole life has been an ongoing experiment!

What do you like most about your work?

I'm always learning new stuff. It's exciting, like a detective story. You start with a question, or a mystery, and you have to use your wits and knowledge to solve it.

Is there anything else you would like to tell our readers?

Be curious about everything. Take nothing for granted. And remember that your health and dietary habits today will affect you later on in life. We all need to take a role in caring for ourselves and our planet.

Teeth are alive. Even though the outside of your teeth seems very hard, it can be attacked by bacteria that cause decay. The slime you feel on your teeth in the morning is made mostly of bacteria. *YUCK!*

Use a brush with soft bristles to brush your teeth gently up and down after meals. Next, you need to floss. Dental floss looks like string. Slide it between your teeth and rub it along the sides of each tooth.

Neat Teeth!

Pearly whites or choppers,
incisors or canines,
molars or bicuspids.
You need them at all times.

They cut and chew and grind.
They bite and break and tear.
They mish and mash and mush.
They get a lot of wear.

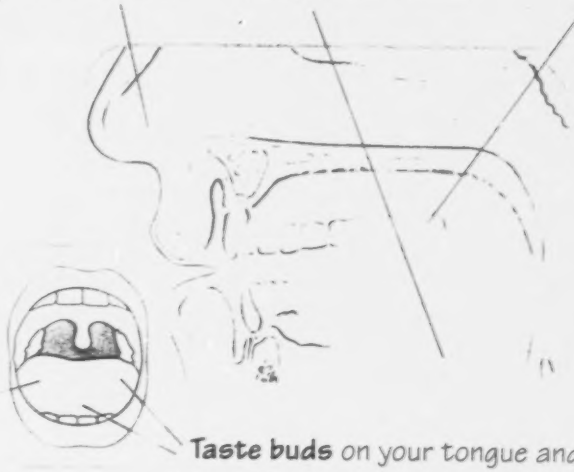
They have a messy job,
but clean they need to stay.
For that you brush and floss,
to keep decay away!

Food comes into your body through your mouth.

Smell is important for sensing flavors in food, too!

Saliva, from glands in your mouth, start digesting starchy foods, like bread.

Your **teeth** cut, mash and grind foods into small pieces that mix with saliva.



Try holding your nose while you taste an apple. What do you notice?

Your **tongue** helps in chewing and swallowing. You also need it for talking.

Taste buds on your tongue and in your mouth send messages to your brain about flavors in food, including salty, sweet, sour and bitter.

Younger kids have 20 teeth that eventually fall out to make way for 32 permanent teeth.

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THE READING LINK

Reading activities to use with

THE MYSTERIOUS MARCHING VEGETABLES

MY HEALTH MY WORLD

FOOD AND MY WORLD

The Reading Links have been created as ready-to-use reading and writing activities that are directly related to My Health My World adventure stories. They are not intended to represent a comprehensive reading program. The activities are related to reading objectives common to many curricula and covering a range of grade and ability levels. Teachers may wish to select from these activities those that are most appropriate for their own students.

Prepared by

Baylor College of Medicine

Houston, Texas

1999

Word Meaning/Context Clues

A. Fill in the circle by the word that best answers each question.

1. Animals that eat only plants are called _____.
   - O decomposers
   - O herbivores
   - O carnivores
   - O omnivores

2. Food gives our bodies the _____ we need to grow and to do things.
   - O bacteria
   - O soil
   - O germs
   - O energy

3. Good soil has many _____.
   - O nutrients
   - O leafcutter ants
   - O germs
   - O pesticides

4. _____ break dead plants and animals down into tiny pieces that go back into the soil.
   - O fertilizers
   - O decomposers
   - O pesticides
   - O proteins

B. **Many Meanings.** Sometimes a word can have more than one meaning. Look at the different meanings for **row** and **break**. Then pick the meaning of those words that fits best in each sentence. Write its number next to the sentence.

row
1. a number of people or things arranged in a line.
2. a line of seats, as in a classroom or theater
3. to make a boat go, by pulling on oars

_____ If we want to sit in the front row, we'll have to get there early.

_____ Riff loved to row the boat around the pond.

_____ The vegetables were planted neatly, all in a row.

break
1. to separate into two or more pieces by force
2. to crack a bone; fracture
3. to make or become unusable
4. a period of rest or relaxation

_____ Be careful climbing in the apple tree. You could fall and break your arm.

_____ Don't slam the gate. You might break it!.

_____ Gardening is hard work. Let's take a break.

_____ Please don't break my new shovel.

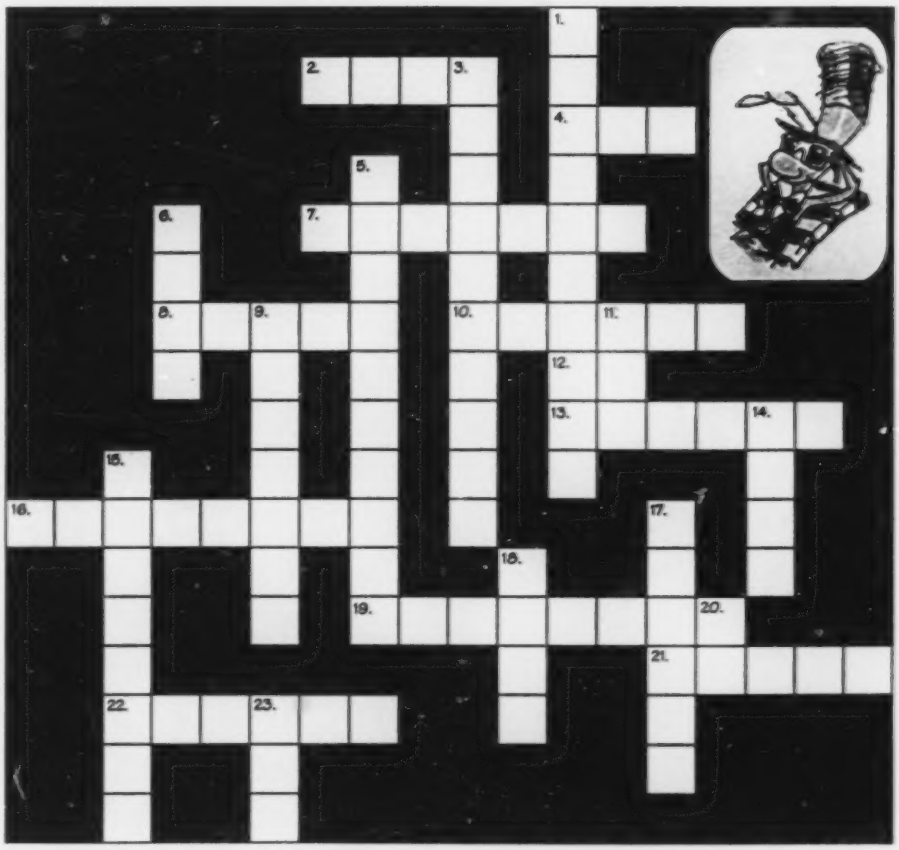
C. **The Mysterious Crossword Puzzle.** All of the words in this crossword puzzle are in the story, *The Mysterious Marching Vegetables.*

Across

2. Rosie's cousin
4. one of these stole Mr. Slaptail's spinach leaves
7. vegetable leaf used in a salad
8. Riff's cousin
10. the opposite of big
12. not two, not too, but _____.
13. Plants get _____ from the sun. We get ours from food.
16. Mr. _____ has a big vegetable garden.
19. Rosie made a peanut butter and carrot _____.
21. They wrapped themselves in leaves and hid in the garden in the dark of _____.
22. An ant is an _____.

Down

1. kind of ant that cuts off leaves and takes them to its anthole
3. something you can add to soil to make plants grow better
5. "The Mysterious Marching _____."
6. a plant with feathery leaves (rhymes with burn)
9. Mr. Slaptail's favorite leafy vegetable
11. An elephant is so heavy, it may weigh a _____.
14. something that can cause a disease
15. what the spinach leaves seemed to be doing
17. All the neighbors came to the Bright Water Corners' _____.
18. Making cookies was Riff's _____. (He thought of it.)
20. short for "hello"
23. "I'm hungry! Let's ___!"



Sequence of Events

A. Read the chapter, "Friends for Dinner," on pages 27–33. Which one of the three things below happened FIRST in that chapter? Write **1** next to it. Then write **2**, **3** and **4** to show the order in which the other events happened.

_____ Oscar Otterbee brought a sack of pecans to trade with Mr. Slaptail.

_____ Mr. Slaptail reminded Riff and Rosie of the picnic.

_____ Mr. Slaptail sprinkled powder around the edge of the garden.

_____ Riff and Rosie dug potatoes.

B. After you have read the whole story, find the event below that happened LAST. Write **4** next to it. Then write the numbers **1**, **2** and **3** to show the order in which the other events happened.

_____ Riff and Rosie made cookies for a big picnic.

_____ Mr. Slaptail told his friends about a mystery in his garden.

_____ The ants visited the picnic.

_____ Mr. Slaptail, Riff and Rosie spent a night together in the garden, wrapped in leaves.

Cause and Effect Relationships

A. Fill in the circle by the word that best answers each question.

1. Why did the characters wrap themselves in leaves when they spent the night in the garden?
   - O To keep warm.
   - O So that they would have something to eat.
   - O So that they would be hard to see.
   - O To keep bats away.

2. Why were Mr. Slaptail's spinach leaves disappearing? _____.
   - O He didn't fertilize them enough.
   - O Leafcutter ants were taking them.
   - O Worms were eating them.
   - O They were wild, and they marched away.

B. Think about what happened when Mr. Slaptail sprinkled a powder around his garden. Write your answers to the following questions.

1. What happened right away?

_____

_____

_____

_____

2. What was the result?

_____

_____

_____

_____

Details and Supporting Ideas

A. Riff and Rosie learned alot about safe food handling and preparation tips to keep themselves healthy. How many food tips do you remember?

B. Rosie and Riff also learned many things from Mr. Slaptail about how to grow vegetables. Write down at least four things that are important for growing health plants and vegetables.

Main Idea

A. 1. **Choosing the Main Idea.** Look at the yellow box at the top of page 10 in the storybook. Which sentence below best describes the main idea of this Grasshopper's Science Box? Fill in the circle next to your answer.

O Plants are amazing.

O Plants are very important food producers.

O Stems carry nutrients and water up to the leaves from the roots.

O The soil in Mr. Slaptail's garden is brown an fluffy, with lots of compost.

2. Look at the yellow box on page 19 in the storybook. Which sentence below best describes the main idea? Fill in the circle next to your answer.

O There are many different kinds of leaves.

O Leaves from maple trees are shaped like the palm of your hand.

O Leaves that need protection can be prickly.

O Tiny green things, called chloroplasts, are the food factories in leaves.

B. Read the chapter called "Night Watch" (pg. 18–21). Write one sentence that tells the main idea of the chapter.

Summarizing

A. In this story, Riff and Rosie spend a night in Mr. Slaptail's garden. In your own words, tell what it is like for them and what happens there.

B. Tell about two different ways in which you might get rid of pesky insects.

Fact and Opinion

Facts are true. Opinions are what someone thinks, but they might not be true. Based on the story, tell whether you think each of these sentences states a fact or an opinion. Write F for :Fact" or O for "Opinion" in each space. (Look back in the story if you need to.)

_____ Grandma's Choco-Crunch Cookies are delicious. (pg. 3)

_____ Mr. Slaptail's garden looks like a jungle. (pg. 6)

_____ We use math every day. (pg. 4)

_____ Mr. Slaptail is Bright Water Corners' best gardener. (pg. 7)

_____ Ants are useful as decomposers. (pg. 15)

_____ Every day, some of Mr. Slaptail's spinach leaves disappear. (pg. 13)

_____ Yellow squash are crunchy and delicious. (pg. 9)

_____ A burglar who gets hungry while he is robbing houses is stealing Mr. Slaptail's spinach. (pg. 13)

_____ Leaves are food factories. (pg. 10)

_____ The cookies looked just like Grandma's. (pg. 14)

_____ Peanut butter, lettuce and apple sandwiches are delicious. (pg. 11)

_____ Dressing-up in disguises is fun. (pg. 17)

_____ The spinach leaves are walking away. (pg. 21)

_____ Dishes need to be washed with soap and warm water. (pg. 15)

_____ Baking soda is a non-poisonous way to make insects go away. (pg. 27)

Following Written Directions

Follow the directions on page 36 to make a paper ant chain. Decorate your finished ant chain.

Inferences/Generalizations and Conclusions

A. Fill in the circle next to the word that best answers each question.

1. How do you think Riff was feeling when he said "I love mysteries. Let's go!"?
   - O scared
   - O lazy
   - O excited
   - O nervous

2. How did Mr. Slaptail feel when he said, "It looks like someone's stealing my spinach!"?
   - O frightened
   - O excited
   - O happy
   - O angry

3. When Riff and Rosie were waiting for the burglar in the garden at night, they were _____.
   - O nervous
   - O angry
   - O sad
   - O happy

4. How did Mr. Slaptail feel when Riff said, "Let's dig up the mound."
   - O happy
   - O concerned
   - O excited
   - O sad

B. After you have read *The Mysterious Marching Vegetables*, decide whether you think each of these sentences is True or False. Mark T for "True" or F for "False" on the line next to each sentence. If you decide a sentence is false (it does not state a logical conclusion from the story), rewrite it below to make it a true statement.

_____ Mr. Slaptail is a good gardner.

_____ Ants are pests, so there is no reason not to kill them.

_____ Polluted soil and water can't make us sick if we don't touch them.

_____ Ants can do amazing things, considering their tiny size.

_____ Almost all animals and plants are useful, in some way, to all of us.

_____ Riff and Rosie get upset with Mr. Slaptail because he always asks for their help.

_____ All food that we eat had to begin with plants, growing in the sun.

Rewrite False sentences to make them true:

Predicting Probable Outcomes

Write another chapter for the story. Tell what you predict will happen after the rain washes the white powder away from Mr. Slaptail's garden. What else might happen in the garden?

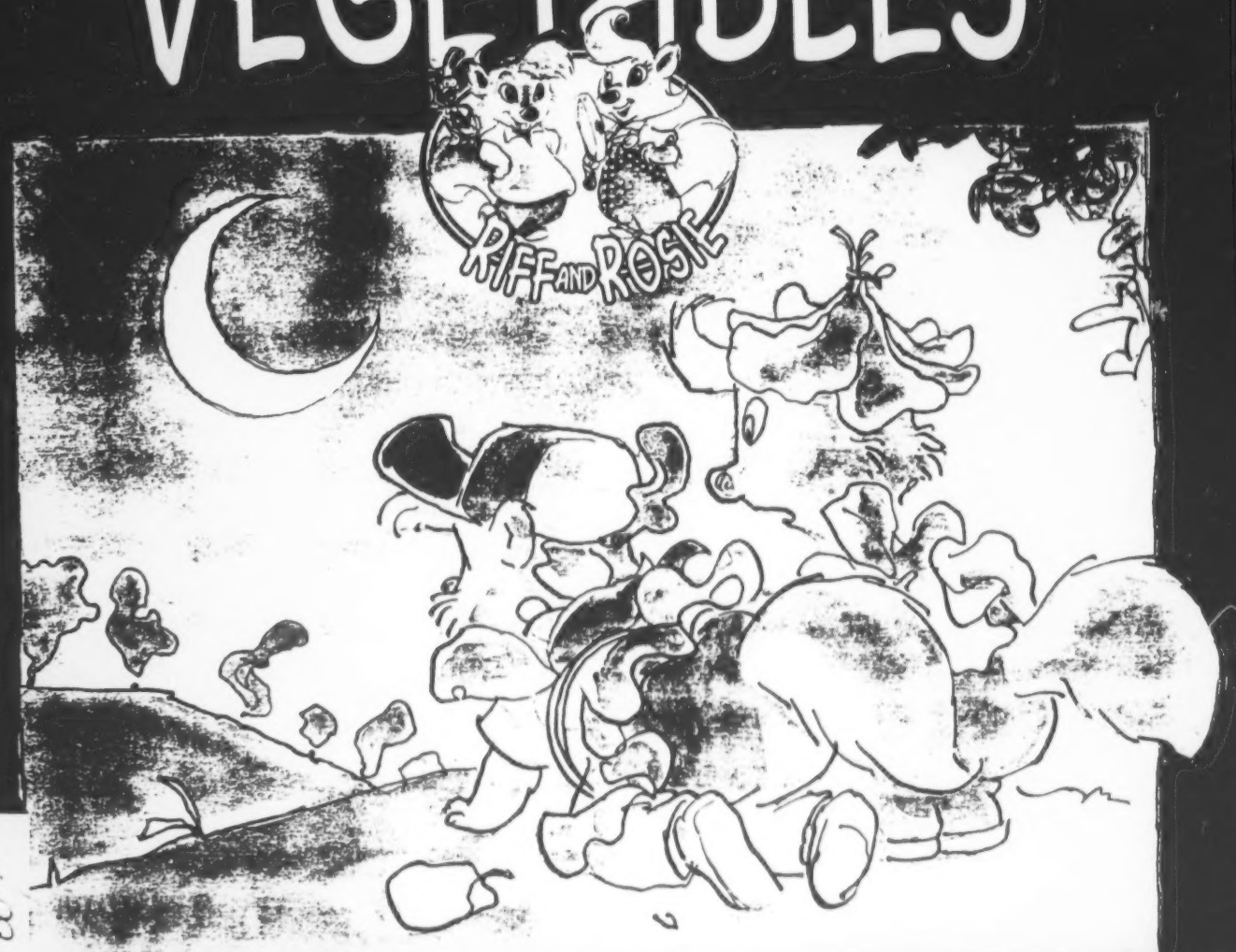
OR

What do you think would happen if Riff and Rosie could talk to the ants and explain the problems the ants are causing for Mr. Slaptail" Write a story, telling what Riff, Rosie and the ants would say, and what would happen then.

Predicting Probable Outcomes (continued)

Y HEALTH MY WORLD
OOD AND MY WORLD

THE MYSTERIOUS MARCHING VEGETABLES



Written by Barbara Tharp, Judith Dresden, James Denk and Nancy Moreno
Illustrated by T Lewis

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My Health My World® Adventures

THE MYSTERIOUS MARCHING VEGETABLES

by

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Baylor College of Medicine

illustrated by

T Lewis

Publications
Houston

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The My Health My World Project at Baylor College of Medicine:
Nancy Moreno, Ph.D., Director
Barbara Tharp, M.S., Co-Director
Martha Young
James Denk, M.A.

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For information, call 1-800-969-4996

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Cookies Anyone?

Riff put the box of cookies down and frowned as he munched and stared off into space. "Rosie, will you please read that weird message from Mr. Slaptail again?"

"I'm not sure where it is," Rosie replied. "You buried it under all your luggage and junk."

"I kind of lost track of it when I looked for those cookies Grandma made for us and Mr. Slaptail. I think the note's under that nature guide to arthropods, next to my hand magnifier."

Rosie sighed at her favorite cousin. She loved Riff, but whenever he came to visit, he brought too much gear. She shoved some of it aside and found the folded note. Rosie read aloud:

"It happened again last night! They're vanishing! I need your help! Come for lunch today at 11:30 sharp! And bring some of your Grandma's cookies!"

Rosie bit into a cookie and said, "What could he be talking about?"

"*What's* vanishing? And *how* did he know Grandma sent him cookies?"

Riff looked into the cookie box and then at his cousin. "Speaking of vanishing, look!" he said. "The cookies from Grandma are all gone."

"Gone?" said Rosie, surprised. "That's such a big box, and I only had . . . ."

"Only . . ." Riff interrupted, "only about a zillion!"

"Well, then you must have had *two* zillion, because I know I didn't eat half a box of cookies," answered Rosie.

"I am feeling kind of sick," groaned Riff, as he rubbed his stomach. "I guess a cookie breakfast was a bad idea. I've

Good food choices keep your mind and body working properly.

Vitamins and minerals in fruits and vegetables help keep you healthy.

Protein in dried beans, meats, chicken, fish and milk products builds muscles.

Calcium from milk, cheese, sardines and yogurt makes strong bones and teeth.

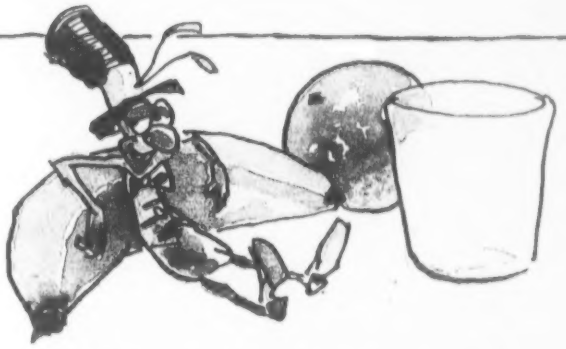
been trying to figure out Mr. Slaptail's mystery and cookies aren't very good food for thinking."

"Yeah," Rosie agreed. "I can think better when I have cereal and milk, especially with strawberries on top. YUM!"

"Think about this. Grandma wanted us to enter a dozen cookies in the bake-off at the Bright Water Corners picnic," Rosie continued.

"I've seen Grandma make those cookies." Riff exclaimed in an inspired voice.

"You must be thinking again," said Rosie with a grin. "I've seen Grandma make them, too. I'll bet we can make more ourselves."



"Hey, how about one of those cookies for me?"

Food gives us energy and the raw materials we need to grow and to do things. All the food we eat has to come from somewhere. Animals like us depend on other living things for food.

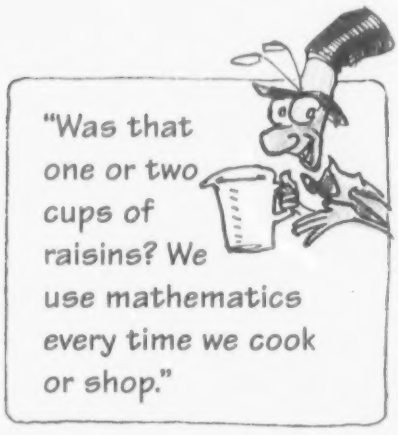
It's important to eat lots of different kinds of foods, especially fruits and vegetables. We also need to make sure that we keep our food safe by keeping our hands and work areas clean.

"How hard can it be?" asked Riff. "I know how to pop popcorn and I make great hot chocolate. Besides, we have do to it. Mr. Slaptail's expecting a batch of Grandma's delicious *Choco-Crunch Cookies*. He's our best friend and we didn't save any for him. Let's hurry. We have to be at Mr. Slaptail's house by 11:30."

Rosie giggled as Riff jumped to his feet. "Calm down, Cookie Boy," she said. "It's a good thing these are no-bake cookies. We don't even need to get permission to use the oven or stove-top. Come on. Let's get busy."

Mixing It Up

"I found Grandma's recipe," said Rosie. "It looks easy," she said, while showing the recipe to Riff. "See? It gives complete directions. We just have to read and follow each step exactly!"



Riff was puzzled. "Look at this, Rosie. It says to add one cup of raisins. That can't be right. I love Grandma's cookies, but I never eat raisins!"

"Well, it also has peanut butter, sunflower seeds, chocolate chips and rice crunchies," said Rosie. "It's Grandma's recipe, and it *does* call for some raisins!"

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"Well," mumbled Riff as he filled the measuring cup. "I guess I like eating raisins after all."

Rosie measured the other ingredients, put them into a bowl, and then carefully stirred the mixture with a big spoon.

Riff, still looking doubtful, poured in the raisins.

Now it was Riff's turn to stir.

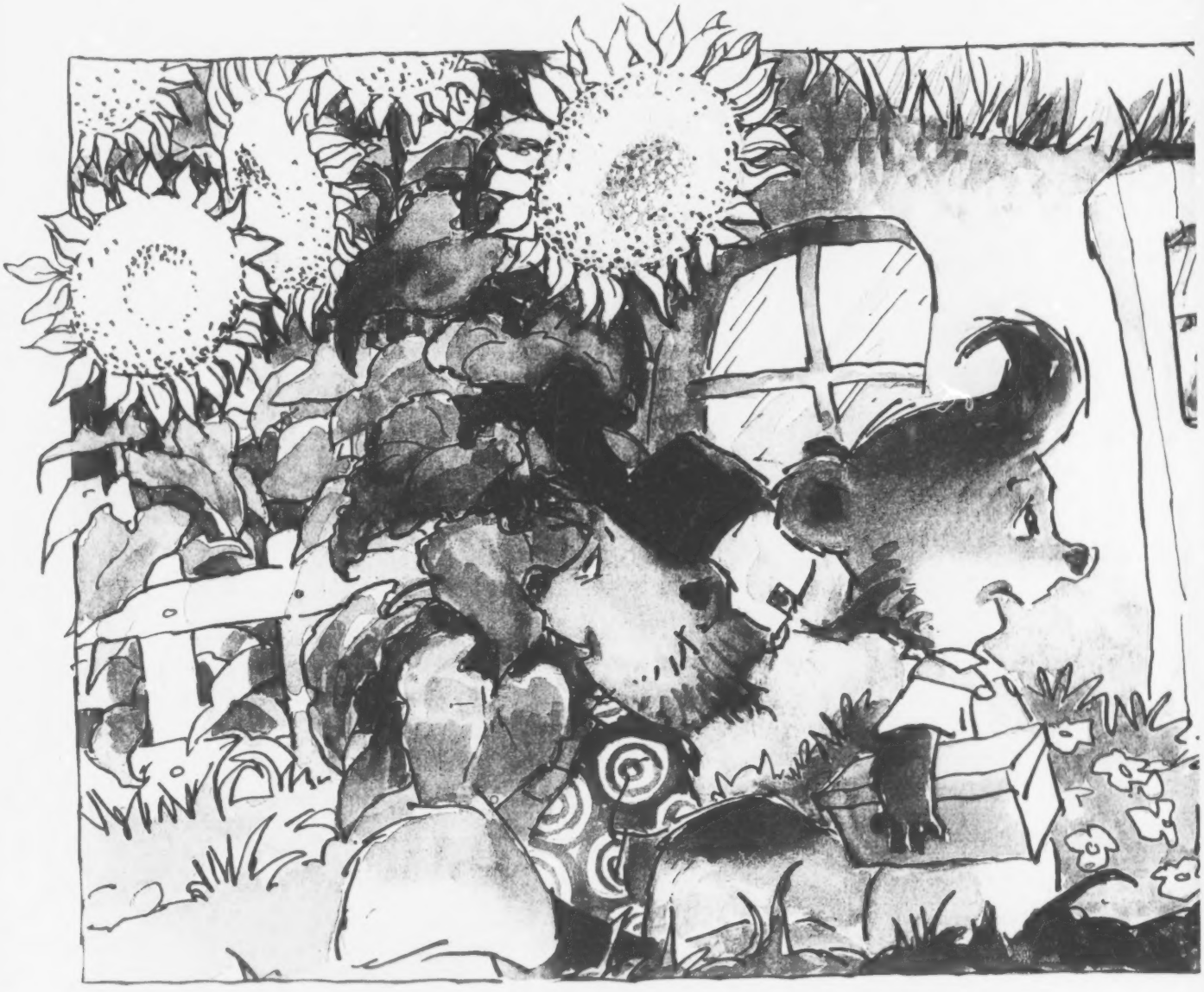
"I just can't get my mind off Mr. Slaptail's mystery," he thought out loud.

Rosie wasn't listening, for at that moment, she was trying to sneak a sample of their cookie dough. "Hey, no fair!" scolded Riff. "Stay out of the bowl."

Riff glanced at his watch. "11:10. We only have 20 minutes to get to Mr. Slaptail's. Now, the recipe says to roll the cookies into one-inch balls," he said as he pulled a ruler from his pocket.

"We don't have time to measure each little cookie with that ruler, Riff," Rosie said. "Let's estimate instead. Just roll the balls about the same size as a walnut."

Riff and Rosie rolled and measured and rolled and measured.



Being Neighborly

The cookies were done and the big box was full once again, with a few seconds to spare. Best of all, Mr. Slaptail wouldn't be disappointed. Riff and Rosie ran out the door to visit their friend.

As they reached his house, Riff stopped and stared in disbelief. "Wow! This looks like a jungle!"

"It's Mr. Slaptail's garden," said Rosie. "Ever since he took up

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gardening, he's been planting things everywhere. He grows the biggest and best vegetables and fruits in Bright Water Corners!"

There were thick green vines with purple and yellow flowers hanging along the fence. Bright yellow sunflowers blossomed higher than the gate. Bees and butterflies hummed and fluttered everywhere. The spicy scent of flowers and ripening vegetables filled the warm air.

Mr. Slaptail appeared from behind a huge bush that was covered with red peppers. "I smell something . . . different," he mumbled to himself.

"You may think this is just dirt, but it has many layers and is home to lots of living things!"
"This is a fungus."
"Check out the earthworm!"
"Here is a plant root."
Soil has tiny pieces of rock and sand; little bits of dead plants and animals; all kinds of tiny and not-so-tiny living things; and even air spaces.

"It's a strange smell. Doesn't belong here. Hmm, chocolate?"

"Surprise!" cried Riff and Rosie excitedly, as they jumped from behind the sunflowers.

"Could it be my two favorite friends?" The old beaver hugged Riff and Rosie, then pulled out his pocket watch. "I was afraid you might miss our appointment. I've been looking forward to seeing both of you, and to having some of your Grandma's famous cookies."

"Well, we've been kind of busy," said Rosie, "making . . ."

Riff quickly interrupted, "Hey, this is great! What a garden! Those are the biggest vegetables and flowers I've ever seen. What's your secret?"

"No secret. Just good gardening," said Mr. Slaptail, proudly. "All it takes is rich soil, sunshine, water and natural fertilizers. Of course, it takes lots of care. That's why I'm so upset about these mysterious disappearances."

Vegetable Wonders

Rosie couldn't contain herself. "Mr. Slaptail, what's vanishing?"

"Let's talk about it over lunch," answered Mr. Slaptail. "I always think better after a good meal."

"Hey, me too!" Riff said.

Rosie sighed.

Riff continued, "I don't see anything here that looks much like lunch. What's in the fridge?"

"Not in the refrigerator." said Mr. Slaptail. "Lunch awaits us in the garden! Let's collect something fresh and make vegetable sandwiches."

"Vegetable sandwiches?" mumbled Riff, shaking his head. "First, raisins in my cookies and now, vegetables in my sandwich?"

"Let's start with these fine yellow squash," said Mr. Slaptail, pulling a shiny little squash from the vine. "They're crunchy and delicious. I like them sliced thinly and sprinkled with a little salt and pepper."

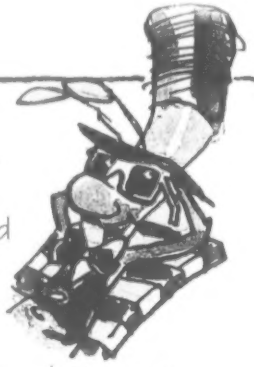
Riff looked doubtful. "How about tomatoes?" he asked. "I like tomatoes on sandwiches."

Rosie was growing impatient. "Mr. Slaptail, can't we talk about the mystery?"

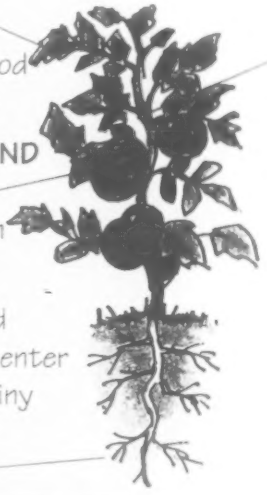
"Of course, Rosie. As soon as we finish here. Oh, and Riff, go ahead and pick some tomatoes," said Mr. Slaptail.

"But Mr. Slaptail . . . !" Rosie thought she might explode from curiosity about his mystery.

Mr. Slaptail just said, "Rosie, would you help Riff gather those juicy-looking tomatoes? Hmmm. What about lettuce? Would you care for bibb or romaine?"



Plants are food factories for everyone. They use energy from the sun, nutrients and water from soil, and carbon dioxide from the atmosphere to make sugar and other substances they need. Since we can't use the sun's energy to make our own food, we have to rely on plants to do it for us!



LEAVES *are the food factories.*

FRUITS AND SEEDS *come from flowers.*

Water and nutrients enter through tiny hairs on **ROOTS.**

STEMS *hold the leaves up to the sun. Water and nutrients travel up stems from the roots to the leaves.*

"It doesn't really matter to me," said Rosie. "They all look like leaves. Now Mr. Slaptail, please tell us about your mystery."

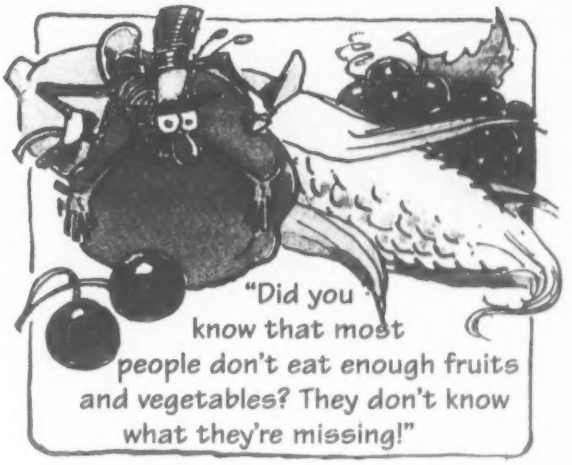
"You're right, Rosie! All varieties of lettuce are leaves. In fact, we eat many kinds of leaves," said Mr. Slaptail, "including spinach, mustard greens, turnip greens and cabbage. Sometimes, we even eat flowers, like broccoli and artichokes."

The trio finished gathering fruits and vegetables, and carried them into Mr. Slaptail's kitchen.

"Now give everything a good rinsing," said Mr. Slaptail. "You must always rinse fresh fruit and vegetables before eating them."

Rosie muttered, "I wish we could get to the mystery!"

A Crunchy Lunch



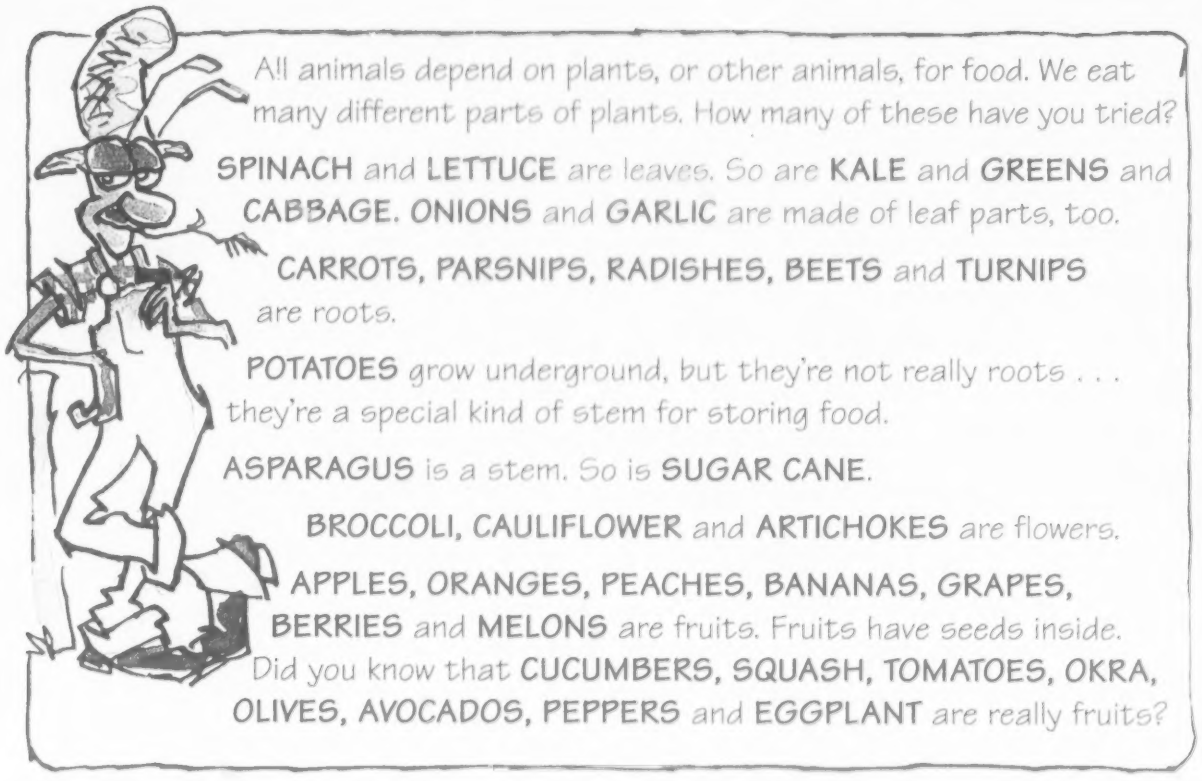
After they finished washing their food, the three friends made their sandwiches and sat down outside at Mr. Slaptail's picnic table.

"This is fun!" Riff said. "We made our own lunch, right from your garden."

"Yeah! This lettuce, apple and peanut butter sandwich is great. It's nice and crunchy!" said Rosie. "Now, about the mystery . . . ."

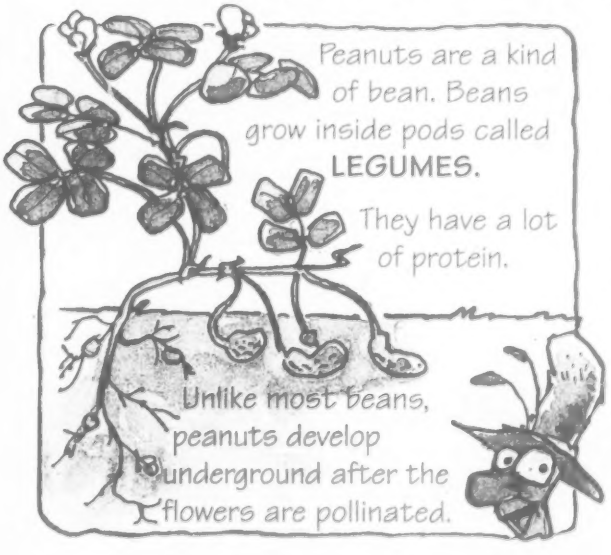
"You know you're eating leaves and fruit, Rosie," said Mr. Slaptail, "but did you know you're also eating seeds from a legume?"

"Legume? Sounds like a disease," said Rosie, wrinkling her nose at her sandwich. "Can we talk about it now, Mr. Slaptail?"


All animals depend on plants, or other animals, for food. We eat many different parts of plants. How many of these have you tried?
SPINACH and LETTUCE are leaves. So are KALE and GREENS and CABBAGE. ONIONS and GARLIC are made of leaf parts, too.
CARROTS, PARSNIPS, RADISHES, BEETS and TURNIPS are roots.
POTATOES grow underground, but they're not really roots . . . they're a special kind of stem for storing food.
ASPARAGUS is a stem. So is SUGAR CANE.
BROCCOLI, CAULIFLOWER and ARTICHOKES are flowers.
APPLES, ORANGES, PEACHES, BANANAS, GRAPES, BERRIES and MELONS are fruits. Fruits have seeds inside. Did you know that CUCUMBERS, SQUASH, TOMATOES, OKRA, OLIVES, AVOCADOS, PEPPERS and EGGPLANT are really fruits?

Mr. Slaptail smiled. "Peanuts belong to the legume, or bean, family. They're full of protein. I grew these myself. That's where your peanut butter comes from!"

Rosie sighed happily. "Mighty tasty legumes."


Peanuts are a kind of bean. Beans grow inside pods called LEGUMES.
They have a lot of protein.
Unlike most beans, peanuts develop underground after the flowers are pollinated.

"I'll bet my cheese with squash and tomato on wheat bread is better," boasted Riff.

"They are both great inventions, but I'll stay with my spinach and corn relish on rye," said Mr. Slaptail. "Spinach is my favorite. In fact, I was going to enter my *Spinach Delight* in the vegetable contest at the Bright Water Corners picnic tomorrow. The only problem is . . . "

Mr. Slaptail's bright mood darkened.

He frowned, leaned forward and whispered, " . . . *my fresh spinach is vanishing!*"

"At last, the mystery!" Rosie shouted.

"I figured he'd get around to it," said Riff, finishing off his sandwich.

"Every day, a few more big tender leaves are gone," said Mr. Slaptail.

"That's terrible! I've never had spinach,' said Rosie. "If we don't stop the bandit, I may never get the chance."

"Maybe it's the Rabbit family," Riff suggested. "Rabbits love spinach!"

"That's not likely. They know I'll share if they ask." Mr. Slaptail answered.

"Have you seen anyone sneaking around your garden?" asked Rosie.

"Of course he hasn't," Riff reasoned, "or he would know who it was! Maybe it's a burglar who gets hungry when he's out at night."

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Fruits and seeds develop after flowers receive pollen from another flower. Sometimes, insects or other animals carry pollen from one plant to another while they hunt for food. Wind and water also carry pollen.

All animals have to get their food from somewhere.

Some animals eat parts of plants. Plant-eaters, called **HERBIVORES**, usually need to eat a lot to get the energy they need.

Some animals eat only other animals. These animals are called **CARNIVORES**.

Some animals eat plants and other animals. They might even eat other living things like fungi and protozoans. Everything-eaters are called **OMNIVORES**.

Fungi, worms and other **DECOMPOSERS** eat parts of plants and animals that have died.

"But there weren't any footprints on the ground in the morning," Mr. Slaptail said, scratching his head.

"Maybe it's a bat. It flies at night and could steal the spinach without touching the ground," Rosie suggested.

"I'm afraid I've never heard of a spinach-eating bat," said Mr. Slaptail.

Riff and Rosie looked at each other and both said, "Then who can it be?"

"I wish I knew," Mr. Slaptail replied.

"Well, whoever it is, we'll help you find the spinach bandit, Mr. Slaptail." Rosie offered.

Riff nodded in agreement. "You bet we will!"

At this, their friend grinned. "Great!" said Mr. Slaptail. "To celebrate, how about some . . . "

"Cookies!" exclaimed Riff and Rosie together.

Riff served the cookies. He was relieved that they looked and tasted just like Grandma's! Maybe he would tell Mr. Slaptail about the first batch of cookies some other day.

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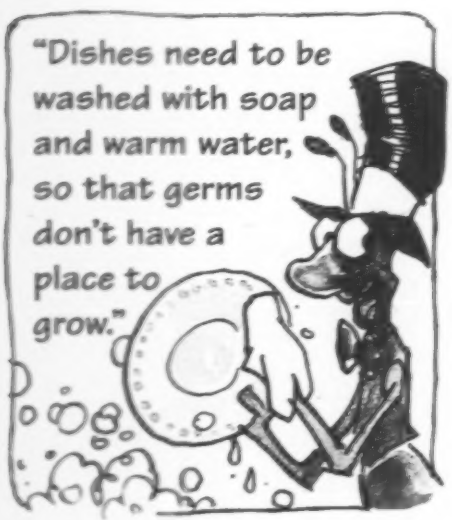
As they sat around the picnic table, Rosie exclaimed, "Look at all the ants!"

"It looks like a bug convention," said Riff. "They're everywhere! We need to get rid of them!"

"Not really," Mr. Slaptail explained. "Many insects, like butterflies, bees, and even ants, are important. They need plants for food, but we need them to pollinate plants. Without insects, many plants would not produce the foods we need. Even these little ants help out in my garden. They break up dead leaves and other things into little pieces that then become part of the soil."



"Huh! Who ever thought bugs could be a gardener's friends?" said Riff, surprised.

Picking a Plan

Riff and Rosie went home after lunch. They still had to clean up from making the cookies before they could work on a plan to trap the spinach bandit.

Riff filled the sink with warm soapy water. "C'mon, Rosie, you're fooling around again. You have to dry the dishes."

"I'm going to let them air-dry. Evaporation will do the work for me. All the liquid will turn into water vapor and POOF, it's gone," Rosie said. "Hey, while we're waiting for the dishes to dry, why don't we plan a trap for the spinach bandit?"

"Let's try brainstorming! It's always a great way to solve problems," said Riff. "My teacher, Mrs. Warthog, always has us brainstorm when we need a solution. Like she says, 'Nothing is ridiculous when you brainstorm.' Sometimes, we come up with pretty silly ideas, but we usually find an answer."

"OK. Then let's brainstorm ways to catch the bandit for Mr. Slaptail," said Rosie.

"We could build little wire traps around the spinach," suggested Rosie.

"We could hang a bucket of water and a rope over the garden gate," said Riff. "And connect the rope to the gate latch. When the bandit opens the gate to get in, POW! The water will dump all over him . . . "

"Or her," interrupted Rosie.

"Or her," continued Riff.

"Or we could sprinkle flour around the spinach and look for foot prints in the morning!" suggested Rosie.

"Or use my night vision binoculars to watch the spinach from the apple tree," said Riff.

"Or we could disguise ourselves and hide in the garden!" said Rosie.

"Hey, that sounds like fun! We have a lot of brainstorming ideas," said Riff. "Let's find Mr. Slaptail so he can help us pick a plan."

Riff and Rosie put the dry dishes away and hurried excitedly back to Mr. Slaptail's house. When they arrived, Mr. Slaptail was putting some of his vegetables into containers, so he could store them in the refrigerator. Riff and Rosie excitedly began to tell him about their ideas.

"You two are full of great plans," said Mr. Slaptail, "and it's time to get serious. One of your ideas is my favorite. Can you guess which one?"

"*Disguises?*" asked Riff.

"You mean dressing ourselves as vegetables and hiding in the garden?" added Rosie.

"That's right. It sounds like a great plan to me," answered Mr. Slaptail. "It'll be fun, too."

Night Watch

The three friends took turns covering each other in leaves and vines. By the time it was dark, they were hidden and ready for the bandit!

"These leaves are tickling my neck," whispered Rosie.

"Only tickling?" asked Riff, loudly. "I feel wrapped like a mummy in these vines! *And* they itch!"

"Shhhh," Mr. Slaptail whispered softly. "The burglar might hear us!" The cousins stopped talking and sat very quietly in the dark shadowy garden.

The night was filled with spooky noises. Tree frogs chirped and bullfrogs croaked. Cicadas buzzed in the trees, and owls "hoot, hoot, hooted" in the night. There were other strange sounds, too.

"What was that?" Riff whispered, afraid to move.

"A bat?" Rosie squeaked. "Did something fly over our heads?"

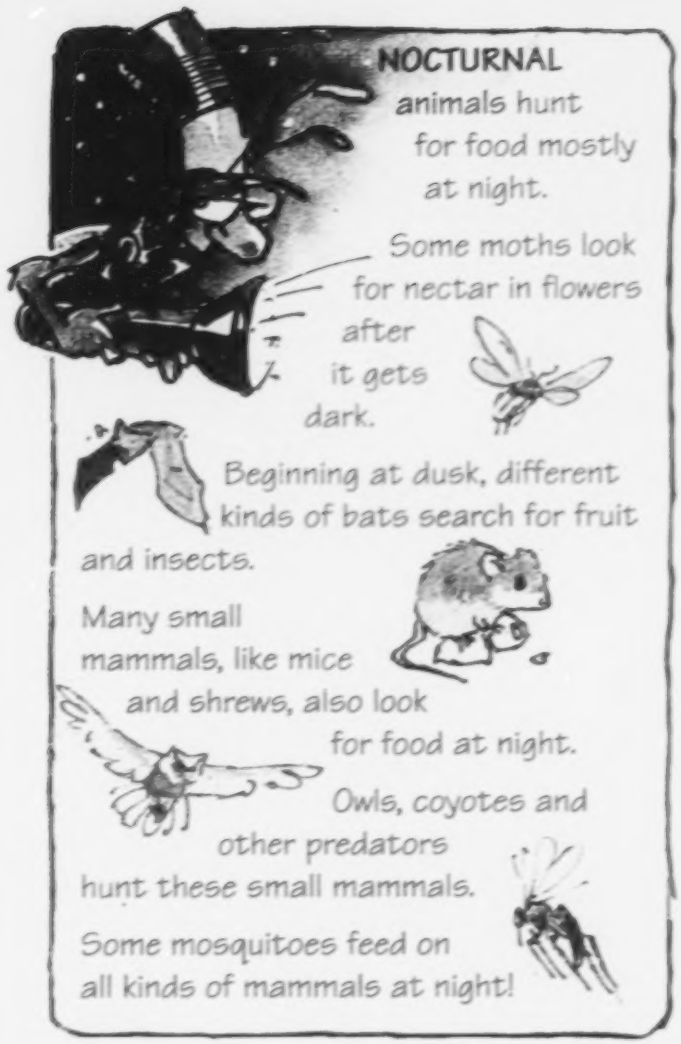
Not daring to shift anything but their eyes, Riff and Rosie looked anxiously for bats and burglars. At the same time, they both noticed that something definitely *was* moving on the ground close by. They held their breath.

Then Rosie sighed in relief. "It's only the wind moving those little pepper plants," she whispered. "This isn't so much fun after all."

Just then, there was a sudden noise!

"Did you hear that?" Riff asked.

Sometimes you can tell plants apart just by looking at the leaves. Leaves can be long and narrow, round, and even jagged. Some leaves are fuzzy. Others are shiny and smooth.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animals hunt for food mostly at night.
Some moths look for nectar in flowers after it gets dark.
Beginning at dusk, different kinds of bats search for fruit and insects.
Many small mammals, like mice and shrews, also look for food at night.
Owls, coyotes and other predators hunt these small mammals.
Some mosquitoes feed on all kinds of mammals at night!

"Yes," Rosie barely whispered in a shaky voice.

"There it is again!" gasped Riff. The ground seemed to shake as the sound grew into a loud roar.

Slowly, Rosie peeked out from her hiding place.

"Riff!" Rosie whispered. "Look!"

Riff looked where Rosie pointed. It was Mr. Slaptail, sprawled in his chair by the edge of the garden. He was fast asleep and snoring like a hibernating bear!

With a sigh of relief, Riff said, "No burglar is going to come here tonight. That snore would scare a grizzly away! We might as well go home."

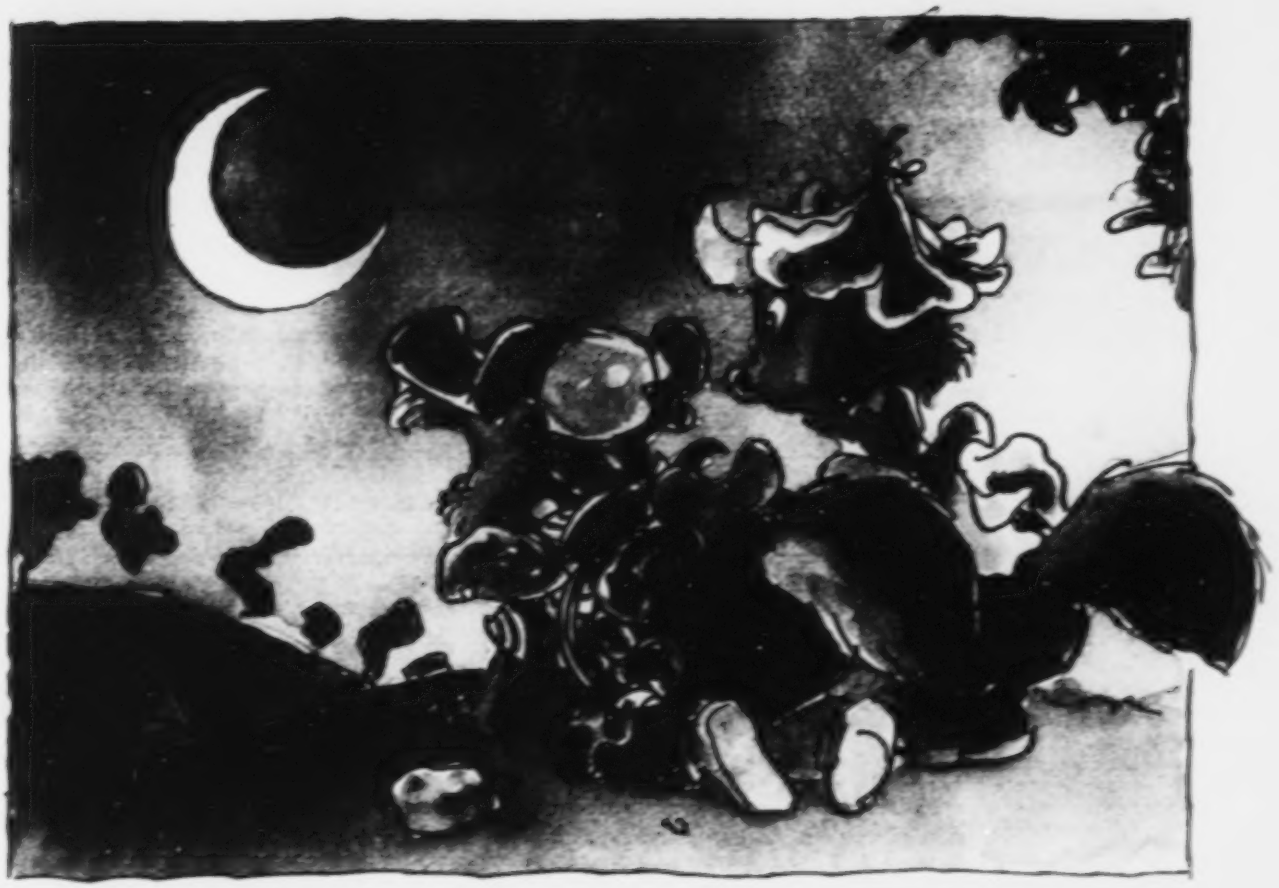
"And leave Mr. Slaptail here all alone?" asked Rosie. "Come on, Riff. Let's just wait for morning."

Riff was too tired to disagree. He curled up in his leafy nest. "I guess you're right!" he yawned. "Wake me at sunrise!"

Rosie settled into a cozy spot to wait. Mr. Slaptail stirred in his sleep and stopped snoring. In the dark silence, it wasn't long before Rosie's droopy eyes closed and she fell asleep, too.

As the light of dawn crept across the sky, Rosie's eyes popped open. She could barely move. Her arms were numb and tingly from sleeping on the ground.

In the dim light, she thought she saw something moving. Rosie rubbed



her eyes and stared at an amazing sight. "What's happening?" she asked herself. "It's not just the peppers moving this time!"

Rosie's voice woke Riff. She pointed toward the edge of the garden and said, "Look! That spinach leaf is walking away!"

"You're right," Riff whispered in amazement. "And there goes another leaf, and another. And another!"

"Are we both dreaming?" Riff asked, pinching himself.

What To Do?

Rosie's answer was cut off, for at that moment, a large dark shape suddenly rose from the other side of the wall. It's huge leafy arms swayed, and it made wheezing, choking sounds.

Rosie yelled, "Look out, Riff! It's a vegetable monster!"

"We *must* be dreaming! " Riff shouted.

"That's a . . . a giant cabbage!" Rosie whispered in amazement. "Oh no! LOOK OUT!"

The mass of cabbage leaves staggered into the low wall, fell over it, and flopped on top of Riff.

"Oomph!" it snorted.

"Hey!" cried Riff. "Now I know we're not dreaming! Rosie! Wake Mr. Slaptail!"

Both cousins started yelling at the top of their lungs, "Mr. Slaptail! Mr. Slaptail! It's a cabbage monster! *HELP!*"

Mr. Slaptail sprang up with a bound, scattering leaves all about. "What? What?" he muttered, still groggy.

"Riff's being attacked by a giant cabbage!" Rosie cried, thumping at it with a huge parsnip.

Without hesitation, Mr. Slaptail lunged at the wiggling lump of damp leaves. There was a struggle! Leaves flew everywhere. Then, from beneath the cabbage leaves came a voice.

"Get off of me, you crazy beaver, or I'll bean you with one of your own bean poles!"

Riff and Rosie looked at each other, confused. "*Mr. Otterbee!*" they both shouted.

The otter and beaver sat stunned for a moment, staring at each other.

"*I knew it!*" exclaimed Mr. Slaptail.

"HOO-HAA! Caught you red-handed, Slaptail!" shouted Oscar Otterbee, Mr. Slaptail's oldest friend. "*You've* been stealing my vegetables!"

"What? *Me?* Stealing *your* vegetables?" huffed Mr. Slaptail.

"Exactly!" said the otter. "You've snagged 'em with a *Veggie Magnet* or hypnotized 'em with one of your dad-burned inventions! I dressed up like this and followed 'em over here right to *you.*"

Mr. Slaptail was getting confused. "Followed them? What or who are you talking about?"

"*Here's* what he's talking about, Mr. Slaptail." Rosie said.

And, as if nothing had occurred, four spinach leaves appeared to walk calmly between the astonished foursome.

"Well I'll be," whispered Mr. Slaptail. "Look at those marching leaves."

"Y'see! Y'see!" hollered Mr. Otterbee. "Explain that, Slaptail!"

"Mr. Slaptail! Mr. Otterbee!" cried Riff and Rosie.

Riff held his pocket magnifier close to the base of one of the mysterious leaves. "It's ants! Ants are taking the leaves away."

"*Ants?*" howled Otterbee "Well, I'll be . . . and all along I thought it was you, Slaptail."

"You might have asked me about it sooner," sniffed Mr. Slaptail. "I've been having the same problem as you. We could have worked together."

"Look!" interrupted Riff. Everyone looked downward. The ants were marching single file, like tiny soldiers, out of the garden. They were carrying spinach leaves many times their size. Riff, Rosie, Mr. Otterbee and Mr. Slaptail followed silently. The insects already in the garden joined up with Mr. Otterbee's ants. They formed a line that led down the hill to a huge ant colony. As each ant arrived with its heavy load, helper ants were waiting. Together, the ants pushed and pulled and tugged on each leaf until it disappeared into the mound.

"Well, even if it wasn't you Slaptail," muttered Mr. Otterbee. "The ants are on your land! They're your ants, and they're taking my plants!"

"Let's dig up the mound!" said Riff, eagerly.

"Not so fast!" said Mr. Slaptail. "That's their home!"

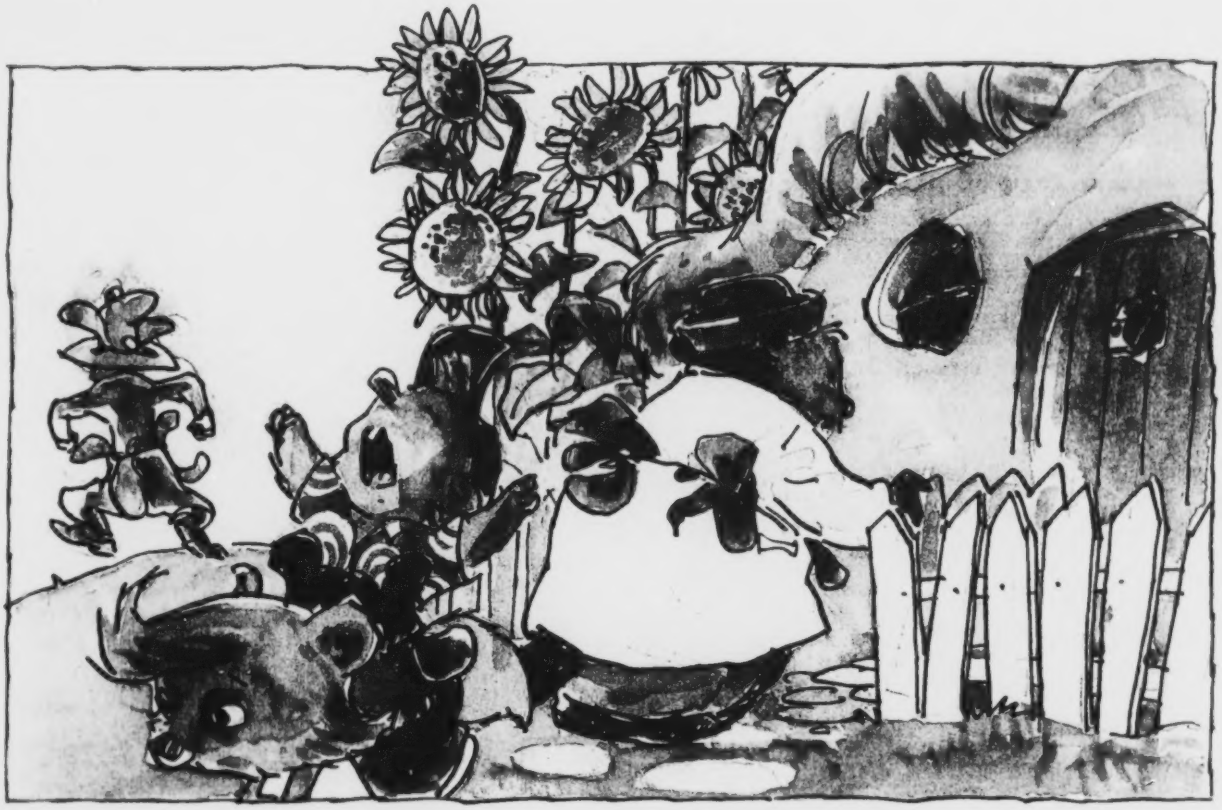
"But they're taking your spinach!" said Rosie.

There are safe ways to get rid of pests. Soapy water will get rid of insects on plant leaves. Baking soda will help with other kinds of pests.

Don't forget to put leftovers in containers. Food left out is an easy meal for cockroaches and other insects.

The Trap

"I noticed the beginnings of this ant colony when I was planting my garden," said Mr. Slaptail. "They've been adding to it bit by bit. That's a lot of work for such tiny creatures! I don't want



to destroy their home any more than I want them to destroy my garden."

"Then how can we keep them out?" asked Riff.

"I know," said Rosie. "Uncle Red Tail uses ant poison."

"Rosie, we don't want to kill them. We just need to keep them out. Anyway, remember how pesticides can wash into the water supply?" said Mr. Slaptail. "That wouldn't be good for anyone."

"Well, we could dig a ditch around the garden and fill it with water!" suggested Riff.

"Ooh. Like a moat! That sounds cool!" Rosie said. "Can we do it, Mr. Slaptail?"

"I'll think about that," Mr. Slaptail said, rubbing his eyes. "But right now, I'm going inside to get some real sleep."

Riff and Rosie decided they needed some rest, too. They headed home slowly in the early morning light, with bits of their disguises still clinging to their clothes.

Friends for Dinner

After a short nap, Riff and Rosie were back at Mr. Slaptail's house. They found him outside, sprinkling white powder around the edge of his garden.

"Mr. Slaptail, I thought you said we couldn't use pesticides! What are you doing?" asked Riff excitedly.

"You're right, Riff, but don't worry," said Mr. Slaptail. "This is only baking soda. It's not a poison, but ants don't like it. I think this will convince them to find their leaves somewhere else."

"But we were all ready to build a moat. Look, we even brought a shovel," said Rosie disappointedly. "Now what can we do to help?"

"Did you forget? Today's the neighborhood picnic. We're all going to share our best recipes. Since those ants got so much of my spinach, I've decided to make my fabulous *Potato Surprise* instead. You can put that shovel to work by helping me harvest the potatoes," said Mr. Slaptail.

"Potatoes?" asked Riff. "Mr. Slaptail, we haven't seen a single potato in your garden."

Mr. Slaptail chuckled, pushed his shovel into the ground and turned up some potatoes. "You can't see potatoes unless you dig them up," he said. "Some kinds of food, like carrots and the peanuts in your sandwich, stay right in the soil while they're growing."

"We want to help!" said Riff and Rosie. They went to work with their shovel. Soon they had a bucket-full of new potatoes and several baskets full of green beans, melons, tomatoes and corn, too.

"Wow! I didn't know there were so many different kinds of vegetables," Rosie said.

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"Oh yes," said Mr. Slaptail. "And there are many more varieties than I have room for in my garden. Now, remember, our harvest must be rinsed thoroughly," said Mr. Slaptail.

"But these things don't look dirty," said Riff.

Mr. Slaptail explained, "Germs and chemicals that can make you sick are often very tiny. You may need a microscope to see them. Fruits and vegetables should be well-rinsed before they are eaten or prepared. And of course, the first thing you should *always* wash is . . . "

"Your hands!" yelled Riff and Rosie.

As they ran towards the kitchen to wash up, Rosie said, "Riff, we promised Grandma we'd enter her cookies in the baking contest, but we ate them all."

"I wish your Grandma was here to make some more," said Mr. Slaptail.

"Me too," hollered a voice from the other side of the garden. "I've been told those are the best, hum-dinger cookies in the county," said Oscar Otterbee, as he came through Mr. Slaptail's gate, carrying a sack.

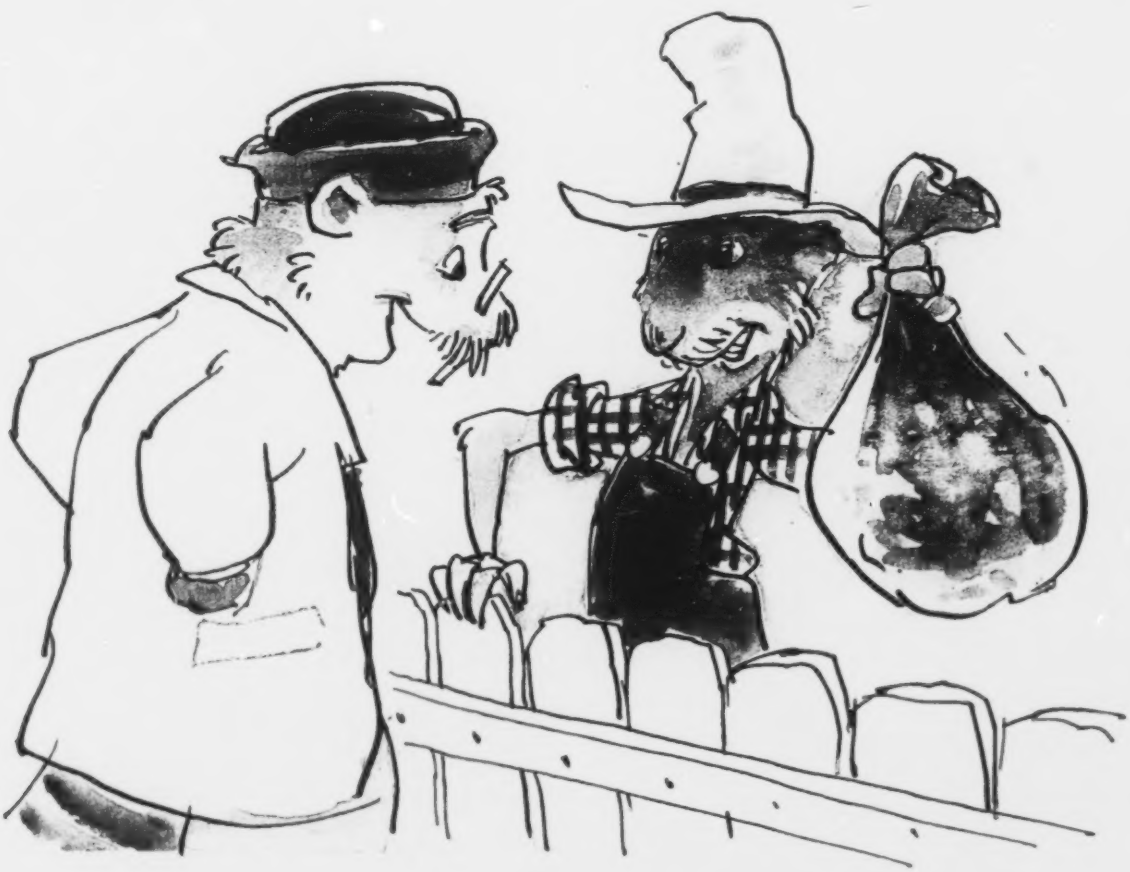
Riff and Rosie looked at each other and whispered, "*Uh-oh.*"

"What is it now, Otterbee?" asked Mr. Slaptail.

"Now calm down, calm down," said Oscar Otterbee. "I've come to patch things up. Thought maybe you'd trade a bottle of your ant repellent and some cookies for a sack of my prized pecans."

Mr. Slaptail sighed and said, "Alright, my friend.

"But there *still* is a problem. It seems we've already eaten all of the cookies."



Riff puffed out his chest. "I'll bet we can make more!"

"You can?" Mr. Slaptail said with a smile.

"Yes, I was going to tell you. We made the ones we brought yesterday because we ate all the ones Grandma sent!" admitted Riff.

"That's okay. I knew something was strange," Mr. Slaptail said, patting his stomach. "Your Grandma's cookies aren't all the same size and perfectly round, like yours were. Your cookies were very good! Very good, indeed."

"You know," Mr. Slaptail continued, "I have most of the ingredients to make more cookies right here: peanut butter, seeds from last year's sunflowers, raisins made from my very own grapes. Hmmm, what else?" asked Mr. Slaptail.

"That's almost everything." said Rosie said, as she gathered Mr. Slaptail's offering of ingredients. "We've got the rest at home."

"Let's go get started," said Riff anxiously. "The dinner starts in an hour!" They raced off with Mr. Slaptail's supplies towards Rosie's house.

When they arrived, they ran to the kitchen, washed up, and then quickly set to work.

The sun was just setting as Riff and Rosie finished making the cookies. Delicious smells filled the air as the neighbors began to arrive at Mr. Slaptail's house.

"Wow! Look at the great variety of food!"
Some foods are produced far away and must be transported long distances.
Cook meats, fish, chicken, turkey and eggs until they are well done to kill bacteria.
RICE
Food gives you energy to move, think and grow. Food also provides building materials for strong, healthy bodies. Exercise is important, too!

Keep fresh food and cooked foods from spoiling by storing them in the refrigerator.
Wash all your cooking gear with warm soapy water. Wash your hands, too! Rinse fruits and vegetables with running water.
Fish, low-fat dairy foods, lean meats and legumes make strong muscles and bones.
Have a varied diet, with lots of fruit, vegetables and grains. Eat less sugary and greasy foods.

"How can you keep food safe to eat?"

People have invented many ways to transport and preserve food to keep it safe to eat.

When things like bacteria have a chance to grow on food, the food will spoil and rot. Spoiled food can make you sick. We keep food safe by . . .

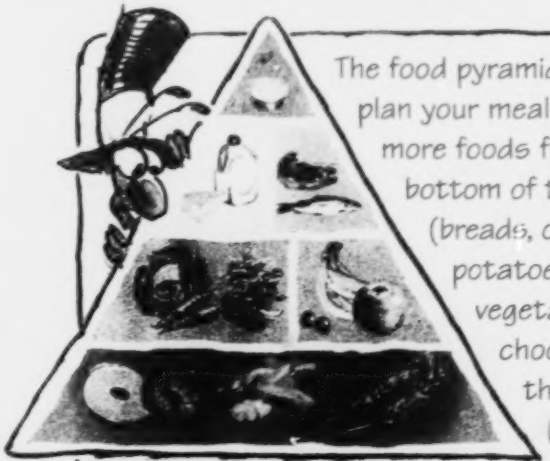
- rinsing fruits and vegetables before eating them;
- drying foods (like raisins);
- cooking food to kill harmful bacteria;
- keeping food cold or frozen; and
- washing hands, work areas and utensils with warm soapy water before and after preparing food.

Food For All!

Every neighbor brought his or her own special dish. Mr. Slaptail's big porch, overlooking the pond, was the perfect place for everyone to celebrate a great harvest.

Riff turned to Mr. Slaptail and stated confidently, "And we made enough cookies for . . . ." But suddenly he stopped, pointed and said, "Uh-oh! Look who's here!"

Rosie and Mr. Slaptail turned to see who was arriving so late. Mr. Slaptail laughed and said, "You know what they say . . . "



FOOD PYRAMID

The food pyramid can help you plan your meals wisely. Select more foods from the wide bottom of the pyramid (breads, cereals, pasta, potatoes, fruits and vegetables) and choose less from the top group, (like sugary and greasy foods).

"No picnic is complete without ants!"

How to Make a Paper Ant Chain

Materials: Two 8 1/2 x 11-inch pieces of paper (notebook or copy paper is easier to work with than heavy construction paper); ruler; scissors; pencil or pen.

Procedure:

ANT TEMPLATE

1. On one piece of paper, draw or trace, then cut out an ant template like the one shown.
2. Lay the second sheet of paper horizontally in front of you.
3. Starting at the bottom, fold and crease the paper twice, so that three equal segments form on the page.

4. Using a ruler, measure the height of each segment to be sure that each is a little less than 3 inches tall.
5. Use your scissors to cut carefully along the creases. You should now have three strips of paper that are about the same size.
6. Change the orientation of the paper strips so that they are lying vertically in front of you.

7. Beginning at the top of one strip, use a ruler and make a mark for every inch until you reach the bottom of the paper.
8. At each one-inch mark, fold the paper, alternating the direction of your folds (one toward the top of the paper, one toward the bottom), so you end up with a "paper accordion." Press your accordion "closed" firmly.

9. Hold the ant template on one closed-end of your paper strip, with the ant's "body" positioned so that the very tips of the ant "legs" hang a little bit over the edge.
10. Use your pencil to draw an outline of the template. You will not be able to outline the very ends of the ant's legs.
11. With your paper accordion still closed, cut along the outline you just drew.

12. Unfold the paper to reveal your ant chain!
13. Repeat steps 7 through 12 to create more two more ant chains.

You may wish to color your ant chain, or *even give* your ants names.

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Glossary

arthropod *(ARTH-roh-pod)* - An animal with jointed legs and a body divided into segments, such as an insect or a spider.

artichoke *(AR-tih-chohk)* - A plant in the daisy family that produces large flowering heads which are eaten as a vegetable when they are still young and tender.

asparagus *(ah-SPAHR-eh-guss)* - A plant with spear-shaped stalks that are eaten as a vegetable.

atmosphere *(AT-muhs-feer)* - Air surrounding the Earth.

avocado *(AH-vuh-KAH-doh)* - A tropical tree that produces an oily green fruit that is eaten as a vegetable.

baking soda *(BAY-king SO-duh)* - A white powder used in baking to make dough or batter rise; also used to repel pests and as a cleaning powder.

bacteria *(bahk-TEER-ee-uh)* - A kind of tiny organism that has only one cell. Most bacteria are helpful to other living things; however some can make you sick.

bibb *(BIB)* - A kind of lettuce with a small leafy head.

broccoli *(BRAH-koh-lee)* - A plant in the cabbage family that produces flowering branches that are eaten as a vegetable.

calcium *(KAL-see-uhm)* - A mineral that is important for living things. It is found in substances such as milk, bone and shells.

carbon dioxide *(KAR-buhn dy-AHK-side)* - A gas made up of carbon and oxygen. You cannot see or smell it.

carnivore *(KAR-nih-vohr)* - Something that eats only animals as food.

chemical *(KEM-ih-kuhl)* - A pure substance. Water, salt and baking soda are examples of chemicals.

cicada *(sih-KAY-duh)* - A large insect with four transparent wings.

colony *(KAH-loh-nee)* - A group of animals, plants or microbes of the same kind living or growing together.

decomposer *(dee-kuhm-POH-zer)* - An organism that breaks down dead plants and animals into tiny pieces that can go back into the soil.

evaporation *(e-VAHP-oh-RAY-shun)* - To change from a liquid form to a gas.

energy *(EHN-uhr-jee)* - Usable power; strength. The ability to act, work or put forth effort.

fertilizer *(FUHR-tih-LY-zuhr)* - Something, such as manure or chemicals, that is added to soil or water so that plants, such as grass or corn, will grow better.

fruit *(FROOT)* - Plant part that forms from a flower and contains the seeds.

fungus *(FUN-guss)* - A living thing, such as a mushroom or mold, that uses other organisms for food, has no green coloring and is not able to move around like an animal.

germ *(JURM)* - Any very tiny living thing that can cause disease.

herbivore *(HERB-eh-vohr)* - A living thing that feeds entirely on plants.

ingredient *(in-GREE-dee-unt)* - Something put into a mixture as a part.

kale *(KAYL)* - A plant related to cabbage that produces large dark green leaves and is eaten as a vegetable.

leafcutter ant *(LEEF-kuht-er ant)* - A kind of ant that uses leaves to produce its food.

legume *(lay-GYOOM)* - The edible fruit or seed of various plants that bear pods. Examples are peanuts, beans, peas and lentils.

magnifier *(MAG-neh-FY-ehr)* - A lens or system of lenses that makes objects seen through it look larger.

mammal *(MAH-muhl)* - An animal that is warm-blooded, has a backbone, some fur or hair, and produces milk to feed its young.

mineral *(MYN-eh-ruhl)* - An element required in very tiny amounts by the body for good health. Calcium, sodium and potassium are examples of important minerals in food.

mustard greens *(MUSS-tuhrd GREENS)* - The leafy part of the mustard plant that is eaten as a vegetable.

nectar *(NEK-tuhr)* - A sweet liquid produced in flowers to attract insects and other animals.

nocturnal *(nahk-TUHR-nuhl)* - Active or blooming at night.

nutrient (NOO-tree-uhnt) - A substance used by organisms as a source of energy or of building material.

okra (OHK-ruh) - A plant that produces a seed pod that is eaten as a vegetable.

omnivore (AHM-nih-vohr) - An organism that eats both meat and vegetables.

parsnip (PAR-snip) - A plant with a root that looks like a whitish carrot and is eaten as a vegetable.

pesticide (PEHST-eh-side) - A chemical used to kill pests, especially weeds and unwanted insects.

pollen (PAH-lihn) - Tiny grains produced by flowers that are necessary for the production of fruits and seeds.

pollination (PAH-lihn-AY-shun) - The transportation of pollen from one flower to another to begin the development of seeds.

predator (PREH-duh-tawr) - An animal that hunts and eats other animals.

protein (PRO-teen) - A substance that occurs in the cells of all living things, and is necessary to life. Meat, beans, milk, cheese, eggs and fish are sources of protein.

relish (REH-lish) - A mixture of chopped vegetables, pickles and other spicy foods. It is used to give flavor to foods.

repellent (ree-PEHL-ent) - Something used to keep pests away.

romaine (row-MAYN) - A kind of lettuce with long dark green leaves.

rutubaga (ROO-tuh-bay-guh) - A plant with a large, round yellow root that is eaten as a vegetable.

shrew (SHROO) - A small mammal with a narrow, pointed nose that feeds on insects.

soil (SOYL) - A mixture of tiny pieces of rocks and sand, and bits of decaying plants and animals.

substance (SUB-stans) - The material of which anything is made.

vegetable (VEHJ-eh-tuh-bull) - A plant whose roots, leaves, stems, flowers or other parts are used as food.

vine (VYNH) - A plant with long stems or branches that uses objects like trees and fences for support.

vitamin *(VY-tuh-mihn)* - A substance found in small amounts in the bodies of plants or animals and which is necessary for the health and normal functioning of the body.

The authors of this story — Barbara Tharp, Judith Dresden, James Denk and Nancy Moreno — are members of the Center for Educational Outreach at Baylor College of Medicine (BCM) in Houston, Texas. They have been working together for several years on science education projects involving teachers and students from kindergarten through college. As a team, they also create instructional materials for the *BrainLink*® project, which has served as a model for the My Health My World® project.

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The illustrator, T Lewis, was born in Texas but has traveled extensively, living in such exotic locales as Africa, Switzerland and Alaska. Currently living in a small town in the state of Washington, where he and his wife are raising their young son, he "commutes" from time to time to Houston to work, in person, with BCM and other colleagues. He holds a bachelor of fine arts degree and has been a teacher in Alaska, 200 miles above the Arctic Circle. While there, he also created paintings that are included in a Smithsonian Institute collection of Alaskan art.

While his broad range of professional artwork has appeared in many formats, T Lewis is especially fond of creating illustrations for children. In addition to those for the BrainLink and My Health My World projects, recent books bearing his work are *The Forgotten Helper, Bedtime Rhymes from Around the World* and *Cinderella: The Untold Story.* He has drawn the "Mickey Mouse" comic strip for Disney Productions and co-authors the comic, "Over the Hedge," appearing in newspapers daily through United Feature Syndicate.

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